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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE

STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations.	Rulemaking 19-11-009

SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) AND CALIFORNIA COMMUNITY CHOICE ASSOCIATION'S SECOND REVISED TRACK 3B.2 PROPOSAL

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Dated: **February 26, 2021**

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Pursuant to the *Assigned Commissioner's Amended Track 3B and Track 4 Scoping Memo and Ruling*, dated December 11, 2020, Southern California Edison Company ("SCE") and California Community Choice Association ("CalCCA") (together, the "Joint Parties") submit this second revised Track 3B.2 proposal.[1]

I.

INTRODUCTION

SCE and CalCCA have continued to evaluate their proposal ("Joint Parties Proposal") in light of the valuable discussions held during the three-day workshop process on February 8-10, 2021. While the workshops have not fundamentally changed the Joint Parties Proposal,[2] they have shed light on the types of issues that would need to be addressed in implementation and have led SCE and CalCCA to the conclusion that none of the identified issues are unsolvable.

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1 Pursuant to Rule 1.8(d) of the California Public Utilities Commission's ("Commission's") Rules of Practice and Procedure, CalCCA has authorized SCE to file this revised proposal on its behalf.

2 Given that SCE and CalCCA have not altered the Joint Parties Proposal, the proposal is attached to this filing for reference as Appendix A. The Joint Parties' workshop presentation is attached to this filing as Appendix B.

To update the record in this regard, SCE and CalCCA offer this filing to provide for clear next steps that would address the concerns identified by stakeholders throughout this proceeding.

II.

POTENTIAL SOLUTIONS FOR IDENTIFIED CONCERNS

The additional details presented in this revised proposal demonstrate the range of alternatives available to address stakeholders' concerns. These supplemental methodologies are not designed to represent final proposals or preferred joint party solutions on these issues, but rather provide a demonstration that the net load duration curve methodology is robust and workable. Specifically, the Joint Parties conclude:

- ✓ While the net load duration curve methodology would not resolve all of the temporal simplifications in the existing Resource Adequacy ("RA") structure, it would make significant improvements and is compatible with further refinements, if necessary, to address temporal concerns, use limitations, and other real-world operational constraints.
- ✓ Further analysis should be conducted to determine the need for additional refinements, including consideration of the policy tradeoffs inherent in adding complexity to RA compliance for both market participants and regulators.
- ✓ Several potential augmentations should be considered to further address temporal and other constraints, including: (1) Minimum Availability Category; (2) modified must-offer obligations in the California Independent System Operator's ("CAISO's") market; (3) required hours for use-limited resource demonstration; (4) a representative day Net Qualifying Energy ("NQE") showing; and/or (5) an adjusted Planning Reserve Margin ("PRM").
- ✓ Resources whose availability may be limited such as hydro or thermal resources with start limitations may require alternative solutions, such as modifying must-offer obligations or forecasting availability based on economic dispatch modeling.

- ✓ While forecasting on a “bottom-up” non-coincident peak basis adds complexity compared with the current “top-down” coincident peak methodology, the added complexity is warranted to achieve the desired reliability goals.
- ✓ Netting wind and solar to produce a net load duration curve will require determination of the forecast uncertainty to ensure the desired level of reliability.
- ✓ Hybrid storage NQE crediting may require additional analysis to properly account for charging limitations (e.g., Investment Tax Credit (“ITC”) limitation).

The recognition of these issues and availability of solutions provide confidence that the Joint Parties Proposal can be carried forward into an implementation phase for further development of a modified RA framework.

The Joint Parties’ discussion in this revised proposal should not be viewed as *recommendations*, but, instead, possible solutions if further analysis indicates that modification of the proposal is needed. In doing so, the Joint Parties believe the Commission will have the information necessary to identify in the scheduled Track 3B.2 decision in the second quarter of 2021 which RA structural reform proposal should be further pursued for implementation.

A. <u>Temporal Aspects of the NQE Formulation</u>

The Joint Parties believe there is merit in addressing the temporal aspects of the Joint Parties Proposal in two phases. The concern, noted by the Joint Parties and discussed during the workshops, is that in creating a net load duration curve, temporal constraints may be overlooked. The first phase is to study the issue to quantitatively address the concern by measuring how likely and how large the problem may be as the needs of the system and the RA fleet continue to evolve. Once the probability and magnitude are known, then the appropriate solution to the issue can be assessed and implemented in the second phase.

1. <u>Quantitative Analysis of the Probability and Magnitude</u>

The issue of temporal concern within this proposal is best described as follows. It is possible to construct a portfolio of resources that meets the Net Qualifying Capacity (“NQC”) and NQE measurements as well as being capable to charge energy storage within the load-serving entity's ("LSE") portfolio, yet may still not meet the reliability needs in all hours since the resources produce energy in a time period that is not coincident with the load needs. Furthermore, concerns have been raised that the proposal may fail to create a level playing field for portfolios relying on different technologies, undermining decarbonization goals and diversification of the state's energy portfolio.

In the current RA program, the temporal concern arises from the fundamental simplification of many grid reliability needs into a single monthly compliance requirement for LSEs and a single valuation for each resource that is unlikely to reflect every dimension of a resource's reliability contributions and operational constraints. While the Joint Parties Proposal seeks to significantly expand the granularity and accuracy of the RA compliance requirement by incorporating explicit accounting for both capacity and energy across multiple hours, it does not explicitly represent every resource attribute as a compliance metric.

Prior to determining the preferred approach to address this concern, further evaluation of the nature and potential magnitude of the temporal issue is needed to determine the appropriate solution, if any, is needed.

As a first step, the Commission should work with parties to further evaluate the temporal concern. While a theoretical portfolio without additional constraints could produce a result that is detrimental to reliability, the Commission and stakeholders should consider the potential of a non-reliable portfolio when the practical constraints of the RA program are considered. Specifically, in addition to the proposed capacity, energy, and storage requirements, every LSE's RA portfolio will be required to meet flexible requirements and will include local RA resources and a significant share of Cost Allocation Mechanism resources. Given the geographic constraints for local and the resource characteristic constraints for flex, it is less likely that an LSE will construct a portfolio meeting the NQC, NQE, local, and flexible needs while running into temporal constraint issues.

As such, the Joint Parties recommend the Commission, in coordination with the CAISO, conduct a study that first evaluates the system as a whole. Ignoring for the moment individual LSEs, the study should evaluate the overall resource portfolio within the CAISO system that will meet the local and flexible RA requirements and the portfolio's ability to meet the net load peak (NQC) and NQE needs as defined within the Joint Parties Proposal. The CAISO has conducted a preliminary portfolio analysis for a single month that could be very informative in this study. While the CAISO has only performed this analysis for a single month, with the portfolio of shown resources for that month, additional months and differing portfolios should be considered. Second, the study should evaluate whether it is possible at the individual LSE level to procure a portfolio that achieves paper compliance but does not adequately contribute to system reliability due to the temporal concerns. Such a study would determine if it is possible for an LSE to lean on other LSEs even if the portfolio at a system level produces a reliable outcome. This analysis is important to ensure that all LSEs equally contribute to grid reliability.

2. Potential Solutions

The Joint Parties have identified several potential solutions to the temporal concern. The selection of the solution, and whether any solution is necessary, will depend on the probability and magnitude of the temporal concern as determined through the study outlined above.

a) Minimum Availability Category Application

Historically, the RA program has included constraints to ensure LSE portfolios do not include excessive shares of use-limited resources through the use of Maximum Cumulative Capacity ("MCC") buckets calibrated to system-level needs. However, the MCC bucket system is problematic for multiple reasons, including its restriction on development of portfolios of use-limited resources which, collectively, provide diversity benefits and reliability value beyond the buckets of their subsidiary resources.

To minimize the likelihood that LSEs show portfolios which are incapable of meeting their demand profiles due to use limitations or other constraints, an additional modeling overlay could be included to ensure LSEs provide resources with minimum operating characteristics. One approach is to create an overlay based on individual LSE load shapes using a simple formula to ensure each LSE shows resources capable of being dispatched with the frequency and duration needed to meet that LSE's peak hours in each month. This is simplified relative to the current MCC bucket calibration approach due to the netting of wind and solar, which have been difficult to fit within the MCC bucket structure. Rather than maximums, this approach could require minimum showings of resources, singly or in combination, that can deliver energy during strips of net load hours to meet specific thresholds of dispatch, such as 4, 8, 16, and 24-hour resource availability durations and minimum available starts per summer month. The exact criteria for which strips would be required and in which amount could be determined on an LSE-specific basis depending on the net load duration curve that the LSE has to serve. For example, an LSE with many hours of excess solar would have no requirement for any 24 hour dispatchable strips since its net load duration curve has no 24-hour periods in which the LSE would need to serve load.

The combination of ensuring that the LSE's portfolio can meet the NQE and the "Minimum Availability Category" ("MAC") structure could then ensure that load needs are met in all hours and the temporal aspects of generation are addressed. This structure would still retain incentives to develop resources (including storage) to meet the duration need of load, because the LSE could identify combinations of resources to meet its MAC requirements.

For example, an LSE needing to meet an 80 MWh energy need over an 8-hour period, given its net load duration curve, could choose a single 8-hour 10 MW/80 MWh storage device or could choose two 4-hour 10 MW/40 MWh storage devices. The process could then count the capacity based upon the MAC bucket structure. In this example, the two 4-hour batteries would count for the same NQC (i.e., 10 MW) as the single 8-hour battery since their use is anticipated to meet an energy need of that duration. Additionally, this could be viewed as counting the capacity from the battery for the energy duration it is designed to serve. That is, what is the maximum capacity the storage device could output continuously to achieve the amount of energy over the duration for which it is being counted. In the example above, the 10 MW capacity 4-hour storage device that can output at that level for four hours would be counted at 10 MW if shown in the MAC for a 4-hour duration device. However, if it is in the 8-hour MAC, the maximum capacity would need to be 5 MW to be able to provide the total 40 MWh accounted for within that category (40 MWh / 8 hours duration = 5 MW capacity). Similarly, contracts for imports and demand response could count in the minimum availability bucket of the contractual obligation and CAISO resources could count up to their appropriate minimum availability bucket dependent on the limitations, if any, for their operation.

This process would enable LSEs to establish the portfolios they desire, including a portfolio of completely non-emitting resources provided they met the NQC, NQE, charging, and MAC requirements shaped to their monthly net peaks as well as total net energy needs. To do so may require an amount of installed capacity from the generating resources well above the load needs of the LSE and energy storage sized appropriately to meet net peak load needs, as well as energy needs through the MAC buckets. The solution is therefore not only capable of meeting current reliability needs but is also durable enough to meet expected future resource changes to meet climate-related policy goals.

b) Must-Offer Obligations

Use limitations are currently addressed through various operational requirements within the CAISO market, which may limit the need to address them explicitly in the RA program. Specifically, the CAISO is presently considering a restriction on storage RA resources that would require a specified state of charge by the net load peak to ensure the resource is available for dispatch at the time the resource is expected to be needed for reliability. Similarly, Pacific Gas and Electric Company ("PG&E") has put forth a proposal that utilizes a "slice of day" concept to place must-offer obligations on resources based upon the period of time they are being used to meet RA obligations. In addition, modifications to either the CAISO Resource Adequacy Availability Incentive Mechanism or the proposed unforced capacity ("UCAP") method could provide incentives for resources to be made available at the time of the expected need.

While these operational requirements can sub-optimize resources on days where system need is different than anticipated within the RA framework, the probability of such an outcome may be outweighed by its benefits, solving some temporal issues without the need for added complexity in RA counting. As such, this mechanism may have a potential application for some portion of the RA fleet to meet reliability needs and should be examined along with the other potential solutions within this document or other identified means that may not yet be available.

c) <u>**Established Hours for NQE Demonstration**</u>

As discussed above, the temporal issue arises when the period of production from resources is not coincident with the load needs for the same time period. For example, a 1 MW resource capable of operating in all 720 hours of a month can produce 720 MWh. But it cannot produce 720 MWh in a single or subset of hours of the month. The study process described above could be used to identify the most likely hours in which an energy need would not be met. Logically, it is unlikely that there will be an unmet energy need in May during the daylight hours as load is low and the amount of renewable energy is abundant. However, it is possible that after the net load peak hour there may be unmet energy need once solar generation has fallen to zero output and the batteries within a portfolio have been depleted. If the study shows specific sets of hours in which energy needs may be unmet even though the NQE appears sufficient, a requirement to have a specified amount of energy from resources during those hours – with assumptions about energy storage usage – could be constructed to eliminate this shortfall.

Inversely, the temporal aspect could lead to a generating resource being credited for NQE in hours and quantities which cannot be used for either the LSE's positive load (after netting) or for storage charging. This NQE – if not sold to another LSE or stored – may be shown despite its inability to be practically used by the LSE or the CAISO for operational purposes. Continued analysis may indicate that this issue requires specific counting rules or exclusions to ensure consistency between usable energy available to CAISO and shown NQE.

As one example, LSEs could be required to demonstrate that their NQE and NQC showings are aligned such that their shown capacity is capable of producing or discharging during hours when the LSE has net load to serve. Specifically, LSEs could be required to demonstrate that their resources – when ranked by hours of production per month – could be stacked in such a way as to serve the LSE's energy needs at the appropriate durations and level of demand necessary.

d) Representative Day NQE Analysis

If temporal issues related to storage charging arise, they are most likely in the context of ensuring sufficient energy for daily charge-discharge patterns. For some months, a portfolio may provide far more energy than necessary throughout a month without providing sufficient charging energy for a particular high-demand day or series of high-demand days. One approach to solving this concern would be to analyze the day or series of days within each month representing the highest stress conditions to determine whether the LSE's portfolio could reasonably serve load throughout this period. This could be an analysis performed on an hourly basis for a single day or could use a slice-of-day similar to PG&E's proposal and apply over multiple days.

Analysis for this method would involve stacking the LSE's portfolio to assess energy sufficiency for each hour (or other period), making simplifying assumptions regarding timing and magnitude of storage and dispatchable resource utilization. Ensuring sufficient charging energy for the most stressed day – likely assessed as the day with the highest net demand, or combination of highest demand and lowest renewable output – probably ensures sufficiency for all other days within the compliance period.

While this proposal would provide an improved assessment of daily charging patterns, thereby reducing the significance of the temporal issues for storage resources, it adds a level of complexity that would complicate program administration for LSEs, the Commission, and the CAISO.

e) Inclusion Within the PRM

The PRM can also be utilized to address a number of uncertainties. During the development of the flexible RA mechanism, the potential of increasing the PRM was raised. With any portfolio of resources, increasing the PRM will mean showing more resources to meet the reliability need. In this case, if the studies show that the ability to meet energy needs in all hours is missed for a short time period and/or by a small amount, it is likely that even a small increase in the PRM will lead to LSEs showing additional resources with sufficient generation characteristics that will meet the energy needs in all hours while creating a modest increase in capacity procurement to meet the net load peak.

As the Joint Parties Proposal has already noted, the appropriate level of the PRM should be completely evaluated to ensure that the expected level of reliability is met given the uncertainties present in any forward-looking reliability framework. If the PRM is used to meet this potential need, the process would need to consider how such an effort impacts the Loss-of-Load Expectation ("LOLE") to arrive at an appropriate value.

B. Energy Expectations From Use-Limited Resources

Use limitations present a unique challenge to any RA structure. Realistically a resource limitation can prevent a resource from providing its capacity to meet peak loads (as per the current RA structure), over the net peak load, and over the energy need. Some limitations are straightforward and depend simply on things like the time of day (e.g., noise restrictions). Other limitations are largely dependent on the economic dispatch of the resource. For example, a start-limited resource could run for all 720 hours of a month if the nodal price it receives exceeds its costs in all hours.[3] However, this same start-limited resource could reach its limit well short of the 720 hours of operation for the month if it is cycled multiple times per day by the market. For such cases, it may become necessary to evaluate the NQE of such a resource based upon economic dispatch modeling. Such modeling is the process the CAISO used to develop its Preliminary Portfolio Assessment. While such resources may be capable of producing in all hours, the RA program should account for the expectation of economic activity that may make limits like the number of starts binding during the RA compliance period.

In addition, use limits and the treatment of those limits will also be highly dependent on the compliance period chosen. The limitations of some resources may be easier to account for in a longer duration compliance period. For instance, the amount of energy from hydro over an entire year may be easier to predict and easier to apply a must-offer obligation to than in a monthly obligation. The reason for this is the uncertainty in any month of energy needs, prices, and future claims on the resource's NQE. In an annual construct, the energy can be shown for the entire year and the resource will have a must-offer obligation sufficient to ensure delivery of that energy. The CAISO's use of opportunity costs in this space help to ensure that the resource is able to provide in the highest value hours. In a monthly construct, the issue becomes more complex as the amount of energy specified within the month impacts the amount of energy that can be provided in future months. This results in questions regarding what the must-offer obligation will be for a resource with a set capacity and a limited amount of energy.

The Joint Parties continue to believe that analysis of requirements should be performed monthly as the netting of wind and solar can differ significantly month-to-month. However, RA compliance could be established on a different basis provided that the temporal aspects discussed in Section A above are addressed for the entirety of the year.

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[3] For simplicity, this example ignores the potential for uplift costs to address short period of uneconomic operation due to a limited optimization horizon such as is present in the CAISO day-ahead market process.

The alternative to this approach is to modify the CAISO's must-offer obligation such that the NQE is treated as a new use limit and when the amount of energy shown for RA for the month has been depleted, the resource is no longer obligated to provide energy during that month to avoid using NQE that has been sold to an LSE for a future month. Similar to must-offer obligations that specify hours, this method may not optimize the resource's output over the entire year as it focuses on monthly maximums for energy. Nonetheless, this is an option to address use limitations in providing energy and capacity to meet reliability needs.

Finally, the measure of NQE will need to account for forced outage rates. Today, forced outages are accounted for within the PRM and the same could be done for NQE needs by forecasting the energy need and increasing the quantity to account for uncertainty, including whether the generator will be on forced outage. In addition, the CAISO is currently evaluating a proposal to utilize UCAP to derate the NQC of a resource based upon forced outage rates. This concept fits well with an NQE proposal in that any reduction in the expectation of capacity is accompanied by a reduction in the expectation of energy. Therefore, the adjustment in NQE could be as simple as using the UCAP capacity multiplied by the expected (for use-limited resources) or potential (for non-use-limited resources) hours of operation in the month.

C. Bottom-Up v. Top-Down

Significant debate about a bottom-up compared to a top-down approach was discussed in the initial implementation of the RA program. One of the issues identified was the difficulty of forecasting load for each LSE and summing up their total, which produces a non-coincident peak requirement which will likely be above the coincident peak needs. As the number of LSEs and their different portfolios have grown, the need to reexamine the current approach has arrived. With a measure of not only the net peak load but energy need as well, the forecasting process will become more complex. While the Joint Parties prefer simplification where possible, the increased complexity here is warranted to account for the differing reliability needs of individual LSEs in addressing system reliability needs.

A review of the forecasting needs under the Joint Parties Proposal should begin as soon as practical to allow the California Energy Commission and the Commission to develop the necessary methods to ensure that the non-coincident peak nature of the forecasting is appropriately accounted for in the net peak load capacity needs and that the sum of the energy needs of the LSEs is equal to the energy needs on the CAISO system. Although such constraints on forecasting models are not desirable, this accommodation is necessary to achieve the appropriate level of procurement to meet reliability needs.

D. Netting and Deliverability of Wind and Solar Resources

The netting of expected renewable output is a new concept within the RA construct. In order to do so, it will be necessary to forecast the expected hourly wind and solar output. Renewables Portfolio Standard and Integrated Resource Planning processes and the CAISO's Preliminary Portfolio Assessment have modeled the expected production of wind and solar over a variety of periods. Each of these processes start with a point estimate of the hourly output. Since the net peak load (NQC) and energy (NQE) requirements within the Joint Parties Proposal will be based upon this netted quantity, it will be important to address the net load uncertainty due to load forecast error as well as deviations from the estimated wind and solar hourly output forecast. As discussed previously, the uncertainty created by such forecasting must be addressed to arrive at the level of reliability that is desired. This can be done either by establishing a forecasting standard that conservatively estimates the wind and solar output or by adjusting the PRM to account for uncertainty in the wind and solar forecast. Regardless of the method chosen, it will be important to evaluate the LOLE of the systemwide portfolio so that the solution arrives at the desired standard.

Wind and solar resources that are netted from load should be deliverable to serve any load on the grid as is required for all other RA resources. However, deliverability has historically been evaluated on a peak load basis which may not cover the grid conditions during all hours of wind and solar production. Recently, the CAISO has added off-peak deliverability to their tariff and is able to evaluate the deliverability of wind and solar resources in hours other than the peak load times. Given the expected growth in wind and solar resources which are not rated to full deliverability, the Commission should work with the CAISO and stakeholders to determine if there are more modifications to the deliverability process necessary to evaluate wind and solar in other hours or if the current split of on-peak and off-peak deliverability is sufficient. If the current process is not sufficient, then the Commission should work with the CAISO and stakeholders to evaluate the deliverability in the periods necessary to accurately account for the reliability value of wind and solar resources within this construct.

E. <u>Hybrid and Co-located Resources</u>

Several parties have questioned whether the treatment of storage combined with wind or solar should be accounted for differently than the same stand-alone resources. There are primarily two questions that need to be answered regarding this issue. The first question is whether the limitations of storage charging associated with obtaining the full ITC benefit should have an impact on the quantity of energy that can be stored within the storage device.
The second question is whether certain technology configurations are appropriately accounted for within combined devices (e.g., DC connections between the solar inverter and storage device that could allow more energy to be stored than what could instantaneously be delivered to the grid by the solar resource alone due to interconnection restrictions).

Within the netting process, the amount of wind and solar output are netted from the load of the LSE. There is no need in the netting process to differentiate wind/solar generation with storage from those without storage since the energy generated by the wind/solar device can be passed through to the grid through the storage device without having been stored. Likewise, there is no need to differentiate hybrid storage devices from independent storage devices; the primary purpose of both types of device is to move that capacity and energy to a different period of time when grid needs are higher. Fundamentally, there is no difference in this calculation as the devices still have NQC value and can still move energy from a period of excess to a period of need, and the Joint Parties Proposal has a test to ensure that the LSE has sufficient excess energy to charge the battery including losses. It is realistically this last part that will require further evaluation in that not all excess energy from the LSE may be used to charge the paired storage device, but only excess energy from the wind/solar device can be utilized. One approach could be to derate the expected charging energy to account for hybrid or co-located resources in a portfolio. For example, in 2020, the Commission adopted a qualifying capacity counting methodology for in-front-of-the-meter hybrid and co-located resources planning to access the ITC.[4] This methodology could be modified to enable the appropriate accounting of energy that would be expected to be available from the battery and the resulting capacity accounting for the charging restriction.

On a related point, the amount of energy that a storage device in a hybrid/co-located environment can be expected to charge should correctly account for the lack of interconnection constraints that would otherwise inhibit the amount of energy the wind/solar device could provide to the grid. This issue has been referred to as "clipping" where the wind/solar device is capable of outputting additional capacity to the grid but does not do so because the interconnection is not designed to handle the incremental capacity. However, when charging a storage device, it is possible that the incremental capacity can be used to charge the energy storage device as it is not subject to the grid interconnection constraint. This incremental capacity may then accumulate in the storage device resulting in more stored energy than if the resources were stand-alone. The Joint Parties believe that their proposal should account for this energy value as the implementation phase commences.

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4 *See* D.20-06-031 at Ordering Paragraph 11.

III.

CONCLUSION

The Joint Parties appreciate the opportunity to submit their second revised Track 3B.2 proposal and assist in the further development of the Commission's RA program.

Respectfully submitted on behalf of SCE and CalCCA,

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Attachment A

Southern California Edison Company and

California Community Choice Association's Track 3 Proposal

August 7, 2020

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SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) AND CALIFORNIA COMMUNITY CHOICE ASSOCIATION'S TRACK 3 PROPOSAL

Pursuant to the *Assigned Commissioner's Scoping Memo and Ruling* issued on January 22, 2020 and the *Assigned Commissioner's Amended Track 3.A and 3.B Scoping Memo and Ruling* issued on July 7, 2020 ("Amended Scoping Memo"), Southern California Edison Company ("SCE") and California Community Choice Association ("CalCCA") (together, the "Joint Parties") respectfully submit their initial Track 3 proposal to the California Public Utilities Commission ("Commission") for Track 3.B.[1]

I.
INTRODUCTION

As indicated in the Amended Scoping Memo, the scope of Track 3.B of this resource adequacy ("RA") proceeding includes:

1. Examination of the broader RA capacity structure to address energy attributes and hourly capacity requirements, given the increasing penetration of use-limited resources, greater reliance on preferred resources, rolling off of a significant amount of long-term tolling contracts held by utilities, and material increases in energy and capacity prices experienced in California over the past years.

2. Other significant structural changes to the RA program identified during Track 1 or Track 2, including:

[1] Pursuant to Rule 1.8(d) of the Commission's Rules of Practice and Procedure, CalCCA has authorized SCE to file this proposal on its behalf.

a. Incentives for load-serving entities that are deficient in year-ahead RA filings, as discussed in D.20-06-031.

b. Multi-year system and flexible RA requirements, as stated in D.20-06-002.

c. Refinements to the [Maximum Cumulative Capacity ("MCC")] buckets adopted in D.20-06-031.

3. Other time-sensitive issues identified by Energy Division or by parties.[2]

The Joint Parties appreciate the opportunity to reexamine the overall structure of the RA program and discuss necessary improvements to ensure the RA program is well positioned to meet reliability objectives as California continues its important mission to decarbonize the state. California has set ambitious clean energy and climate goals to reduce greenhouse gas ("GHG") emissions 40 percent below 1990 levels by 2030 and achieve 100 percent of electricity retail sales from zero-carbon resources and carbon neutrality by 2045.[3] As California's electric system transitions to powering 100 percent of retail sales with carbon-free electricity, the nature of the resources interconnected to the California Independent System Operator ("CAISO") grid will evolve. These changes bring different challenges as operating these resources is bound by different constraints than those in existence when the RA program began nearly 20 years ago. At that time, relatively few resources had physical constraints due to use limitations. This enabled a system in which RA could be constructed to meet the peak load and MCC constraints,[4] which ensured that primarily contractually obligated resources were available in the hours needed to serve load.

As California continues to progress in meeting its decarbonization goals, the existing RA framework is increasingly poorly suited to ensuring reliability for California's decarbonizing, high-renewables electric system. The peak-load focused construct was adequate for a system

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2 Amended Scoping Memo at 4-5.

3 *See* Senate Bill ("SB") 32 (2016); SB 100 (2018); Executive Order B-55-18.

4 The MCC buckets were constructed to ensure that load in all hours was met by restricting the amount of short duration contracts that were designed to serve super-peak and peak needs. Over-reliance on such resources would meet the peak load need but may not be available in later hours to serve the load at hours other than the peak load hour.

dominated by thermal, hydroelectric, and other conventional generation. Today, however, the limitations of resources are less often set by contractual obligations and more frequently by physical limitations and in some cases, regulatory limitations. For example, in Track 2 of this proceeding, a new cap was set on the amount of wind and solar resources that could be counted within MCC Category 4 (i.e., resources available 24 hours per day) in recognition that wind and solar facilities are generally not available to meet load in all 24 hours of the day.[5] The number of use-limited resources is increasing significantly as the grid continues its evolution in generation technology. Not only are wind and solar limited in production to hours in which ambient conditions allow for production, but other resources are also increasingly use-limited.

Battery storage technology deployment typically has a dispatch duration of four hours with one to two cycles per day. Moreover, natural gas-powered resources have had increasing use limitations placed upon them including noise restrictions prohibiting operation in some hours and criteria pollutant limitations that cap total production. These limitations have placed significant pressure on the current RA construct. The peak load-based RA construct fails to capture possible reliability issues arising outside of peak hours and struggles to reflect contributions of renewables, storage, and other resources providing off-peak energy, load shifting, and other reliability services. This evolution has created a pressing need for a review of the RA program structure to ensure that RA can continue to provide reliability as the nature and capability of generating resources changes to achieve California's policy goals.

In addition, the landscape of load-serving entities ("LSEs") and their procurement preferences are dramatically changing. At the outset of the RA program, there were a few LSEs with most load concentrated among the three large investor-owned utilities. When California's environmental policy goals were in their infancy, the technologies available in both type and quantity were limited. Each LSE met its environmental mandates in a very similar manner. This meant that the pressure on reliability from any LSE was proportionate to their load ratio

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[5] *See* D.20-06-031 at 53-58, Ordering Paragraph 19.

share. Today, the number of LSEs has increased dramatically and the expansion of clean energy and GHG reduction goals coupled with the reduced costs for renewable technologies has resulted in a rapid expansion of use-limited renewable technologies. It has also meant that LSEs are no longer meeting environmental mandates in the same manner. In fact, some entities have established their own goals to surpass California's mandates for clean energy.

These developments have been a positive outcome for the state's decarbonization and other environmental policy goals. However, the reliability structure of the RA program is under new stresses that are only increasing. Now is the appropriate time to implement a new RA design that will continue to ensure reliability as the resources used to serve load continue to change. The Joint Parties propose such a new RA construct in the comments below. In addition, the Joint Parties have attached to this proposal a presentation describing the RA construct.

II.
PROPOSED RA CONSTRUCT

With generation technology continuing to evolve, the RA construct must evolve along with it. This new model must recognize the constraints of resources and develop a fleet capable of meeting both the capacity and energy needs of the grid. The MCC buckets were not designed with the current fleet of resources in mind; they were developed for an electric system with non-use-limited resources only limited by contractual obligations. Contractual obligations are not likely to mirror the physical limitations of resources as the grid moves forward, and those physical limitations do not always follow the traditional load shape experienced on the grid.

Indeed, much has been discussed regarding the concept of a net peak load. Net peak load is the amount of peak load served after netting wind and solar output. While the current RA construct targets sufficiency to serve peak load, there is growing concern regarding the ability to serve net peak load, peak load after netting production from wind and solar resources. It is widely known that the net peak load occurs later in the day where gross load is not at its peak, but still relatively high and solar production has dropped significantly as the sun sets.

These conditions coupled with the use limitations of resources other than wind and solar make the MCC buckets significantly less effective than they once were, and a re-evaluation based upon a more accurate accounting of use limitations is warranted.

A redesign of the RA construct is needed to ensure the original intent of RA is upheld. RA targets should account for both the net peak load need and the energy need. Responding to this new reality, this proposal evolves the RA construct to incorporate energy and capacity explicitly. It moves beyond the need for inaccurate proxy constraints for intermittent renewables, demand response, and other resources that will increasingly dominate California's resource mix. Further, it will more properly align LSE incentives and compliance requirements towards procuring a resource mix which can meet their customers' reliability needs in all hours. RA should be capable of providing sufficient capacity in all hours to meet energy needs given a desired level of reliability to be achieved through the RA requirement.

The framework described does not address all issues that need to be addressed (see Section V). The Joint Parties recognize that implementing this new RA construct will require quantitative analysis to achieve the desired level of reliability as well as additional work on the implementation details of each element. The Joint Parties look forward to addressing these issues with Commission staff and stakeholders.

A. <u>Net Peak Load Need</u>

The peak load need has evolved and the need of the grid to meet the net peak load has become important from a reliability perspective. Accordingly, it is the appropriate time to measure net peak load need explicitly and establish reliability criteria to meet this objective. To accomplish this task, the load forecasting process will need to change. These changes are necessary because it will be the individual LSE hourly load forecasts that will become the focus of requirements, rather than the aggregation of those forecast values. In addition, while the individual load forecasts will serve as the basis for RA requirements, the sum of LSE energy needs will still need to equal the CAISO energy needs. At the same time, individual load forecasts and requirements for net peak load will result in a non-coincident peak net load. This non-coincidence will never be lower than the coincident net peak load and will likely be higher. The RA process will need to account for this over-estimation of net peak load to avoid over-procurement. The methodology will need to be driven by quantitative analysis that accounts for all sources of uncertainty (e.g., load variations, renewable resource output profiles, fossil resource limitations) in the RA program and evaluate those against the desired level of reliability to arrive at an implementable structure.

RA requirements should also reflect individual LSE contributions to reliability needs. LSEs are utilizing increasingly different portfolios of resources to serve their customer energy needs. These differences have been driven by different technologies with differing characteristics, and particularly different use limitations. Because of this, each LSE portfolio can have a significantly different impact on grid reliability. Therefore, the net load forecasting process would be applied to each LSE individually by creating an hourly load forecast by LSE for every hour of the compliance month.

This load would then be reduced by anticipated wind and solar generation within the LSE's portfolio. Such wind and solar generation profiles could be developed based upon the geographically specific profiles utilized in the Integrated Resource Planning ("IRP") proceeding, R.20-05-003. The profile, along with the contracted and planned wind and solar capacity that is fully deliverable,[6] would then produce an expected energy output from wind and solar resources. This hourly generation profile would be subtracted from the managed load forecast[7] of the LSE

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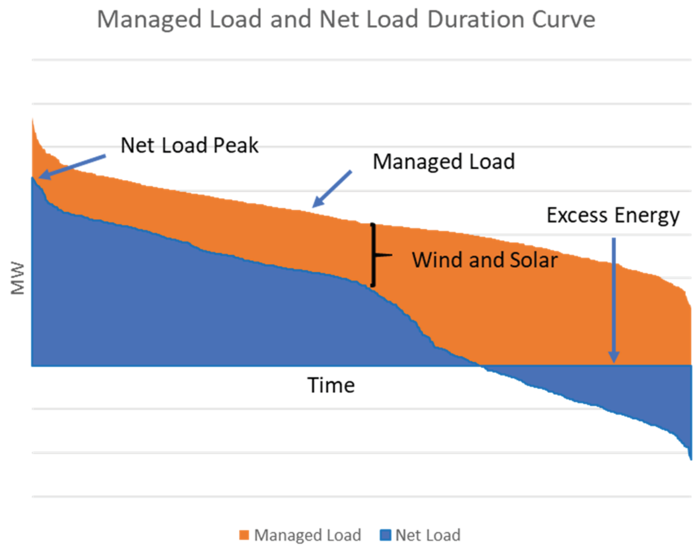
[6] The definition of "full deliverability" status should be re-examined under this proposal. Full Capacity Deliverability Status historically has been viewed as the conditions necessary to deliver output under peak load conditions. Under this proposal, both the ability to deliver under peak load needs and as energy in all other hours are equally important. Restricting the deliverability study to one set of conditions is unlikely to produce an outcome that is consistent with the reliability contribution of all resources to the grid. While this proposal uses the term "fully deliverable," the definition of this term will need to be evaluated to accurately reflect both peak load and energy needs.

[7] Managed load refers to the load on the grid after behind-the-meter resources are netted from gross load. Thus, the proposed methodology would establish the RA requirements after netting behind-the-meter generating actions and in-front-of-the meter wind and solar that is shown in the LSE's portfolio.

to create a net hourly load curve. Rank ordering this curve would produce the net peak load as the highest value observed. It would also indicate the overall amount and duration of energy needed above and beyond the renewable generation as well as the amount of energy available for storage charging. These values would then create the RA capacity need of the LSE that must be met by resources other than wind and solar resources as shown in Figure II-1 below.

Figure II-1

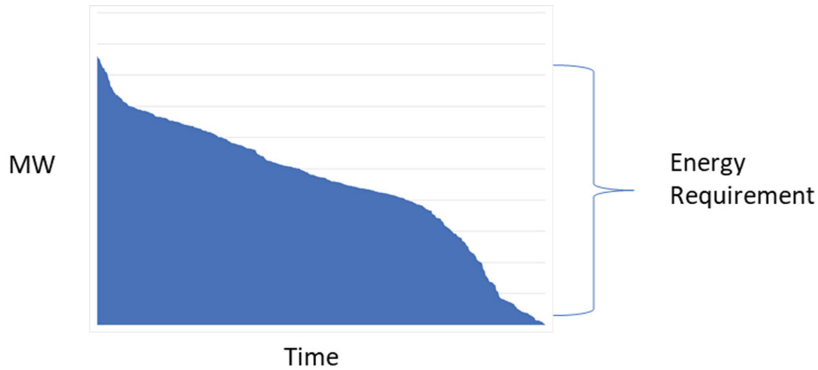


B. <u>Net Energy Need</u>

With the challenges facing the MCC buckets and the ability of wind and solar resources to meet energy needs when ambient conditions allow, the framework to provide assurance that the grid has sufficient ability to meet load needs in all hours would shift from the MCC bucket concept to an explicit measurement of energy need. The use of the net load duration curve from the peak net load need can be utilized. The net energy need of an LSE is represented by the area under the curve where the net load is a positive value. Based upon the area under this curve, the LSE will need to serve not only the net peak load but also the net load in all other hours. Because this load is already net of shown wind and solar generation (specifically, wind and solar that is fully deliverable and qualifies as an RA resource), the resources utilized to serve this load will need to come from resources other than wind and solar. The sum of the hourly loads will represent the amount of energy from the LSE's procured capacity that is necessary to meet the energy that cannot be supported by wind and solar as shown in Figure II-2 below. It is important to note that while this is an "energy" need, compliance will not require the procurement of "energy" but rather capacity with the capability to produce energy. This topic will be discussed in Section IV.

Finally, the Joint Parties acknowledge that the use of a load duration curve and the use of energy output from RA resources has the risk of a binding temporal constraint that is not accounted for in the mechanism. In other words, the use of a net load duration curve does not directly account for the specific hour in which the energy is needed while a Net Qualifying Energy ("NQE") structure likewise does not address specific hours. NQE is a new concept in this proposal that would utilize the capacity and operating hours of the resource to define the possible energy output from the resource to meet energy needs. This concept is further described in Section III. The Joint Parties recognize this limitation and recommend that this issue be examined in workshops to determine the probability that the existing fleet of resources and expected loads will produce such a result. If such a result is possible given the current fleet and expected loads, then the probability of it occurring should be evaluated along with the magnitude of the deficiency. Once these elements are known, any of several options for addressing this deficiency can be implemented within this proposal to resolve the reliability concern accurately. This issue is further addressed in Section V.D.

Figure II-2
Net Energy Need

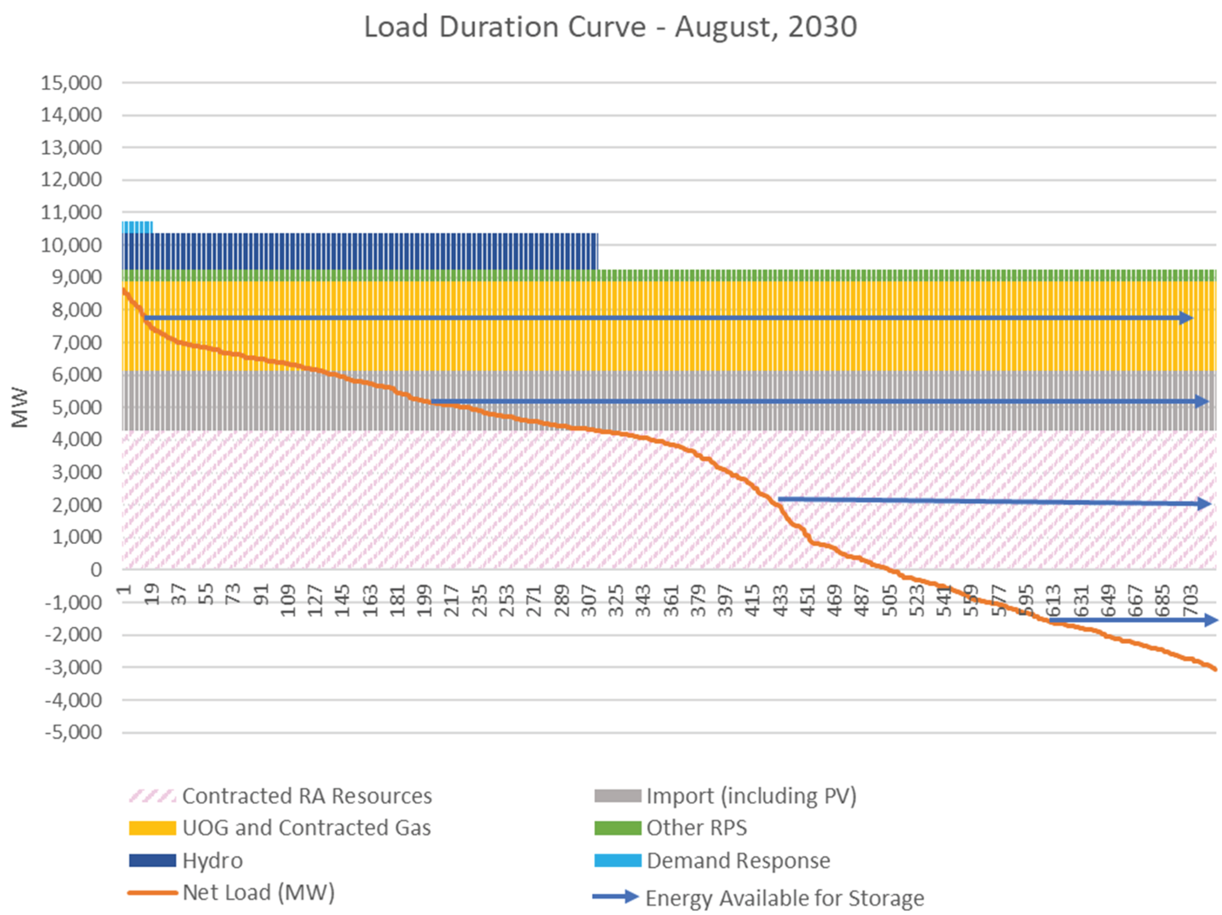


C. Energy Storage

Use of energy storage by an LSE to meet their net peak load needs will require verification that the LSE's portfolio has sufficient energy to meet both its load and storage charging needs. An LSE who plans to use energy storage resources to meet its net loads would need to show there is enough excess energy available from their RA capacity, after serving their instantaneous load, to charge the storage device including efficiency losses.

The excess energy available to charge an LSE's storage resources would come from one of two sources. Over-supply conditions in the LSE's portfolio would provide excess energy available and used for charging storage resources. That is, the amount of wind and solar in an LSE's portfolio produces a negative net load because the amount of wind and solar energy exceeds their load needs. A second source may come from energy output of resources that can produce in more hours or more energy at times than are needed to serve the LSE's load.
The excess generation is shown in Figure II-3 below.

Figure II-3



III.
RESOURCE COUNTING

Consistent with the current RA framework, the capacity counting for resources will be an important measure. Similar to the current RA framework, this proposal would use the RA program to evaluate the resources necessary to reliably operate the grid assuming only the RA resources are made available to the CAISO. Critically, this means that the resources used to meet the RA obligation will need to be fully deliverable to ensure they are not likely to be congested off the system at a time of need and each resource will have a must-offer obligation to make the energy associated with the capacity available to the CAISO. In addition, minimum operation from resources will still need to be in place. The shortest duration currently allowed in the RA structure is a minimum of four hours per day, three consecutive days in a row. The Joint Parties understand this minimum was in part established to allow the CAISO reasonable assurance that the dispatch of such a resource would likely cover the peak load hour. Under a shift to net peak load, this concern remains; therefore, this proposal would not change the minimum hours of operation of a resource to qualify for RA.

Because this RA proposal contains a capacity and energy measurement, it will be necessary to define a new counting attribute associated with a monthly energy output of the resource. This concept is similar to the capacity counting mechanism, which utilizes Net Qualifying Capacity ("NQC") to measure the amount of capacity that can be relied upon to meet peak load needs. In this case, it is the amount of energy – the Net Qualifying Energy or NQE – necessary to meet the energy needs of the LSE for the month. The NQE would need to account for the amount of energy that could be expected from the resource given any use limitations for the month. For example, a hydro resource with a 100 MW capacity that could operate at that capacity for 300 hours for the month would have a 30,000 MWh NQE and a 100 MW NQC. The specifics of NQE development for each resource is a detail that will require working groups or workshops to determine the correct methodology and measurement for each resource for each month.

A. Wind and Solar Resources

As noted above, fully deliverable wind and solar resources would be netted from the managed load to formulate the net load curve for the LSE. In doing so, this method would form a refined effective load carrying capability ("ELCC") that accounts for the expected contribution to reliably serving load in each hour. Rather than evaluating ELCC as a generic derating of the capacity (i.e., NQC) of a wind or solar resource, this ELCC methodology would account for the expected contribution to capacity in each hour. In addition, this methodology would value the over-supply from such resources as they provide excess energy for energy storage to meet capacity and energy needs in other hours.

This RA model would continue to require that grid reliability is accounted for assuming that only the RA fleet of resources are available for operating the CAISO grid. This will mean that the wind and solar resources utilized in the new load netting methodology will need to be fully deliverable and will have a must-offer obligation. These requirements do not differ from the current RA construct where wind and solar interconnect as fully deliverable[8] and the resource must bid or self-schedule the CAISO renewable energy forecast amount.

This methodology will better reflect the value of renewable resources in meeting grid reliability needs because it accounts for their hourly contributions. LSEs can identify the need for energy and energy storage resources and the flexibility to move energy from one period to another to meet reliability and energy needs. Moreover, it will obviate the need for a single ELCC value as used today in which an environment of decreasing ELCC values may discourage development of resources that otherwise could benefit reliability.

B. Other Resources

Other resources would continue to utilize the current RA structure, including developing an NQC value and being subject to a must-offer obligation at the CAISO to make their energy available to the market from the capacity procured. NQC values already exist for all other resources and that methodology would continue under this construct. As noted above, this construct would require the development of a new measure of energy contribution to the grid from the RA resource. The specific details of this accounting would be developed in further working groups. This methodology would replace the MCC buckets to provide for the amount of energy that could be produced by the portfolio of resources within the LSE's RA showing.

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8 The Joint Parties acknowledge that the CAISO has updated the interconnection process for wind and solar and hybrid and co-located (i.e., wind or solar combined with energy storage) resources. This proposal would need to be coordinated with the CAISO's rules to ensure that the output from the resource can be used to meet reliability needs including the storage of energy for use at another time.

For CAISO-interconnected resources, this value would be based upon the physical characteristics of the resources accounting for any use limitations. For import RA, the contractual obligation would define the amount of NQE that the resource could meet as imports are still largely governed by contractual obligations. For example, a 100 MW super-peak import (four hours per day for all days of the month) would have an NQE of 12,000 MWh (30 days * 4 hours * 100 MW assuming 30 days in the month).

C. <u>Energy Storage</u>

Discussion has occurred regarding the need for long duration storage assets. The ability to store over-supply in a storage device may necessitate large inverter capability while the output may be of a lower capacity value and over a longer time. In this sense, the Joint Parties' proposed RA framework has the potential to be superior to the current RA framework because LSEs can decide whether long or short duration storage assets are needed to satisfy their RA obligations as the temporal issues discussed in Section V.D. are further developed and procure the most cost-effective fleet to meet their needs. Thus, while the minimum four-hour duration will need to be maintained for reliability, this RA structure will enable suppliers and LSEs to procure a variety of storage devices that are most capable of meeting their capacity and energy needs.

IV.
<u>COMPLIANCE</u>

Compliance with this RA structure consists of understanding the components that meet the multi-prong test and understanding the method to evaluate the compliance of an LSE's showing.

A. <u>Compliance Instruments</u>

Because the compliance mechanism would become a three-prong test (capacity, energy, and storage), the compliance instruments become capacity (NQC) and energy (NQE). The Joint Parties reiterate that while there is now a measure of energy need, the compliance instrument does not need to be the procurement of energy specifically. Rather, the NQC and NQE are counting mechanisms that are combined with a must-offer obligation so that if necessary, for grid reliability, the energy associated with NQC and NQE will be made available to the grid. The value of energy storage will also be denominated NQC and NQE. Therefore, the change in structure is limited to considering only one additional element.

B. Compliance Evaluation

At a high-level, the following is a method to evaluate compliance with the three-prong test as well as a simplified compliance example.

Step-by-Step Compliance Process

1. Develop NQC for all RA resources in a process similar to today.
2. Develop NQE for all resources. Detailed methodologies to determine the NQE for various types of use-limited resources will need to be developed during implementation workshops.
3. Develop a load curve utilizing California Energy Commission ("CEC") load forecast data on an LSE basis. The details of load forecast methodologies will be developed in consultation with the CEC, including methods for LSE data on load modifiers and local load shapes.
4. Develop expected renewable energy from wind and solar using LSE's portfolio of resources and an energy profile for those resources from the IRP to account for expected energy from wind and solar resources.
5. Net the load curve with the wind and solar output.
6. Rank order the net load from highest to lowest to create a net load duration curve.
7. Establish the peak net load need as the highest hour net load.
8. Establish the energy need (NQE requirement) as the sum of the positive hourly loads for all hours. This represents the area under the net-load duration curve.
9. Commission provides notice to LSEs of their individual allocations of Cost Allocation Mechanism and Central Procurement Entity procurement with sufficient advance notice to enable effective procurement by those LSEs. The allocations count toward the LSE's NQC and NQE compliance requirements.

10. LSE shows resource portfolio to meet RA need, including dischargeable storage, dispatchable renewables, and thermal resources under RA contracts.

11. Portfolio is assessed to see if there is sufficient capacity to meet the net peak load of the LSE.

12. Portfolio is assessed to see if there is sufficient energy available from the resources (including storage resources but net of energy required to charge storage) to meet the net load needs of the LSE during the hours of positive net load.

13. If there is storage in the LSE portfolio, the energy need above is assessed to determine if there is excess energy necessary to fully charge the storage to deliver the necessary capacity.

The tables below demonstrate the step-by-step compliance process with an example. For simplicity, Table IV-1 through Table IV-5 below are examples consisting of only a single 24-hour period rather than an entire month (e.g., the total of 720 hours assuming 30 days in the month where 720 hours equals 30 days * 24 hours/day) as the RA program would ultimately need to consider.

Table IV-1- Creating the Net Load Curve (Steps 3 – 5)

Hour	Installed Capacity		RPS Profile		Expected Energy		Managed	Net
Ending	Solar	Wind	Solar	Wind	Solar	Wind	Load	Load
1	2,175	770	0%	95%	-	731	1,686	956
2	2,175	770	0%	63%	-	482	1,662	1,180
3	2,175	770	0%	63%	-	483	1,546	1,063
4	2,175	770	0%	55%	-	421	1,473	1,053
5	2,175	770	0%	41%	-	318	1,495	1,177
6	2,175	770	0%	36%	-	280	1,580	1,300
7	2,175	770	21%	16%	467	125	1,571	979
8	2,175	770	57%	28%	1,248	217	1,496	31
9	2,175	770	77%	2%	1,665	15	1,454	(227)
10	2,175	770	86%	2%	1,875	15	1,458	(431)
11	2,175	770	90%	2%	1,966	15	1,440	(540)
12	2,175	770	92%	2%	1,997	16	1,480	(534)
13	2,175	770	89%	2%	1,926	18	1,617	(328)
14	2,175	770	82%	2%	1,791	18	1,757	(52)
15	2,175	770	82%	8%	1,776	62	1,880	42
16	2,175	770	73%	31%	1,593	236	2,045	216
17	2,175	770	60%	26%	1,299	200	2,049	549
18	2,175	770	26%	47%	562	363	2,170	1,245
19	2,175	770	1%	58%	30	449	2,263	1,784
20	2,175	770	0%	60%	-	463	2,224	1,761
21	2,175	770	0%	73%	-	564	2,263	1,698
22	2,175	770	0%	70%	-	542	2,202	1,660
23	2,175	770	0%	68%	-	523	2,034	1,512
24	2,175	770	0%	74%	-	566	1,639	1,073

Table IV-2 - Evaluating the Peak Net Load and Net Energy Needs (Steps 6 – 8)

Net Load Duration	
1,784	Peak Net Load
1,761	
1,698	
1,660	
1,512	
1,300	
1,245	
1,180	
1,177	
1,073	
1,063	
1,053	
979	
956	
549	
216	
42	
31	
(52)	
(227)	
(328)	
(431)	
(534)	
(540)	
19,278	Positive Net Energy Need

Table IV-3 - Evaluating the NQC and NQE of the LSE Portfolio (Step 10)

Portfolio of Resources		
Technology	NQC	NQE
Thermal (no use limitations)	900	21,600
Hydro (limited to 8 hours run time)	300	2,400
Run of River Hydro	200	4,800
Geo Thermal	200	4,800
DR (4 hour availability)	100	400
Battery	100	-
Total	1,800	33,600

Table IV-4 - Evaluating the Sufficiency of the Portfolio to Meet NQC and NQE Needs (Steps 11 – 12)

Compliance Evaluation			
	Requirement	Portfolio	Pass/Fail
Net Peak Load	1,784	1,800	Pass
Net Energy	19,278	33,600	Pass

Table IV-5 - Evaluating the Excess Energy Necessary to Charge Storage Devices (Step 13)

RA Portfolio Available for Charging								
Load	Thermal	Hydro (Use limited)	Hydro (run of river)	Geo Thermal	DR	Sum	Available for Storage	Usable by Storage
1,784	900	300	200	200	100	1,700	-	-
1,761	900	300	200	200	100	1,700	-	-
1,698	900	300	200	200	100	1,700	2	2
1,660	900	300	200	200	100	1,700	40	40
1,512	900	300	200	200		1,600	88	88
1,300	900	300	200	200		1,600	300	100
1,245	900	300	200	200		1,600	355	100
1,180	900	300	200	200		1,600	420	100
1,177	900		200	200		1,300	123	100
1,073	900		200	200		1,300	227	100
1,063	900		200	200		1,300	237	100
1,053	900		200	200		1,300	247	100
979	900		200	200		1,300	321	100
956	900		200	200		1,300	344	100
549	900		200	200		1,300	751	100
216	900		200	200		1,300	1,084	100
42	900		200	200		1,300	1,258	100
31	900		200	200		1,300	1,269	100
(52)	900		200	200		1,300	1,352	100
(227)	900		200	200		1,300	1,527	100
(328)	900		200	200		1,300	1,628	100
(431)	900		200	200		1,300	1,731	100
(534)	900		200	200		1,300	1,834	100
(540)	900		200	200		1,300	1,840	100
							Total	2,030

Battery NQC	Efficiency	Energy Needed
100	85%	471

Requirement	Portfolio	Pass/Fail
471	2,030	Pass

V.

ELEMENTS REQUIRING FURTHER EXAMINATION

As stated above, this proposal is intended to be a framework. Many implementation details will need to be considered to develop an implementable RA framework, especially those requiring fact-based assessment of the empirical data or modeling to assess how the metric will function in practice. This section includes a brief description of the elements that will require further development. In some cases, quantitative analysis will be necessary to ensure that the appropriate level of reliability is attained.

A. Product Trading

As discussed in Section III, this proposal would define RA compliance in terms of capacity (NQC) and energy (NQE). The Joint Parties do not explicitly include within this proposal the ability to transact the NQC and NQE separately. However, if these products are not tradeable, LSEs may be forced to over-procure collectively, driving up customer costs. This proposal is structural; the implementation of separable and tradeable products should be discussed and evaluated within working groups or workshops. Historically, this discussion has focused on two fronts. First, the separation of the products must ensure that elements are not counted multiple times inappropriately (i.e., not allowed to be double counted). Second, the market must be able to transact without significant concern for the potential application of market power, either through limited supply or from withholding. If evaluating this proposal examines the ability to trade NQE and NQC separately, evaluation of these two elements will be necessary. That said, the Joint Parties see the potential value of such transactions to meet reliability while minimizing cost.

For example, one could imagine two LSEs where LSE1 has sufficient capacity (NQC) and excess energy (NQE) while LSE2 has energy storage but insufficient energy (NQE) to satisfy the energy storage needs. In this case, the combination of LSE1 and LSE2 may be sufficient for grid reliability needs for both capacity and energy and all of the resources shown by the LSEs have a must-offer obligation, meaning that the grid will operate reliably, yet the compliance showing would represent a deficiency in LSE2's portfolio. This issue could be resolved by allowing LSE1 to sell NQE to LSE2 to satisfy their energy needs while still satisfying its own energy needs.

B. <u>Diversity Benefits</u>

During the original development of the RA program, stakeholders heavily debated using a "top down" instead of a "bottom up" approach. The "bottom-up" approach utilized LSE-specific needs to develop RA requirements. The "top down" approach utilized the RA need at the CAISO level and allocated that need to LSEs on a load ratio share basis. The benefit of the "top down" approach was the simplification that the overall compliance need was only what was needed to meet total system reliability needs. The requirement was based upon the coincident peak need at the time of the CAISO need, rather than the non-coincident peak needs of LSEs individually. The current RA program is a "top down" approach and was possible given the similarity of loads and resources from all LSEs that made the allocation of RA on a load ratio share basis an approximation that was sufficiently accurate.

As discussed above, LSE portfolios are significantly diverging. This divergence makes the use of a "top down" approach difficult because allocation on a load ratio share basis is no longer sufficiently accurate to ensure reliability. This proposal is a "bottom up" approach. However, using a non-coincident peak need will tend to over-state the grid's total needs. The Joint Parties believe a method should be developed to ensure that the use of a "bottom-up" approach does not result in significant over-procurement when considering the diversity of loads on the grid. This issue should be part of a comprehensive discussion of planning reserve margin ("PRM") and methods for addressing uncertainties such as load forecast error and forced outage rates.

C. Uncertainty

The current RA program deals with a level of uncertainty. The 15 percent PRM attempts to account for known needs (i.e., ancillary services) and uncertain needs (i.e., generator forced outage rates and load forecast error). These issues are treated differently depending upon the process. For example, system RA utilizes a one-in-two load forecast with a PRM while local RA utilizes a one-in-ten load forecast and a variety of contingency events without a PRM. Each method accounts for uncertainty but does so in differing manners.

The Joint Parties recognize that utilizing a netting of wind and solar output will introduce a different element of uncertainty. Today, ELCC addresses the uncertainty of wind and solar output by derating the counting capability of the resource. For the new methodology in this proposal, the uncertainty of generating output from such resources will need to be addressed in a different manner. This could be done with a more conservative energy output profile (e.g., using a forecast output representative of a one-in-ten-year outcome) or by increasing the PRM to account for the variability in wind and solar output.

Some parties have expressed concern about load forecast error and generator outages that are in excess of the current PRM. There should be a comprehensive examination of the PRM and all factors that address uncertainty to enable the RA program to achieve the needed level of reliability. This should include currently open items such as the CAISO's RA Enhancements stakeholder process which, in part, is examining the use of an unforced capacity mechanism to account directly for forced outages of resources, the appropriate level of load forecast certainty for both system and local purposes, as well as the study processes utilized to set RA needs such as the Local Capacity Requirement studies. The Joint Parties anticipate that this process can develop explicit rationale behind the use of various processes and the level of the PRM such that any future changes to these mechanisms can be informed by their original design, intent, and established levels.

D. <u>Temporal Aspects of Load and Generation</u>

As discussed in Section II B, there is a possibility that in creating a net load duration curve, the relationship of energy and the time period in which it can be generated and the load and the time period in which it will be consumed can create a deficiency that the three compliance mechanisms proposed cannot detect. The probability of this occurrence depends highly on the shape of the net load and the capability of the fleet of resources. For example, where the monthly peak net load is sustained for a high number of hours and a significant amount of resources are limited to very short duration output, it is possible that the portfolio shown will pass the net peak load test and show enough energy in total to meet the NQE needs, but the energy will be in excess in some periods and not be available in others where the net peak load remains high.

This concern is best addressed by first quantitatively examining the elements that would lead to such an outcome. These elements are the nature of the load, renewable, and nonrenewable profiles. While the outcome summarized in the preceding paragraph is possible, the solution to this issue is best addressed by knowing the probability of such an outcome and the potential magnitude of the outcome. Once this information is known, a targeted approach can address this concern if the empirical data shows it is necessary. This issue should be part of the workshops/working groups to develop the details necessary to implement this proposal. In addition, future capability of the portfolio of resources to meet all needs including temporal aspects of loads and resources should be evaluated in the IRP proceeding to ensure that the build out of new resources meets all grid needs. Those workshops/working groups should include the CAISO, the Commission, and stakeholders, to first evaluate the data for existing resources and loads to ascertain the probability and the magnitude so that the workshop/working group can determine if a new mechanism is necessary to address the issue and if so, what it should.

VI.
OTHER RA ELEMENTS

The Joint Parties' proposed RA framework will work for both system and local RA needs. While system RA is the current process that will benefit the most from this structure, local RA will ultimately benefit from this structure because in order for California to meet its environmental policy objectives, reliance upon natural gas-powered energy in the local areas will need to decrease. This will lead to the same resource constraints (i.e., use limitations) in the local areas that are becoming prevalent for system RA. Because it will take some time to evaluate and develop this proposal into an implementable solution, and with the continuing desire to decarbonize the electricity sector in California, developing this proposal to meet both system and local RA needs is appropriate.

Flexible RA will continue to be relevant in the immediate term. This will necessitate the continuation of the flexible RA program, which can still be denominated in capacity and evaluated as it is today. Thus, like today's program, LSEs must show a quantity of resources capable of meeting ramping needs. These resources will also satisfy the LSEs' system needs and, depending upon location, their local needs.

As the current fleet of slow ramping dispatchable resources retire and IRP develops resources necessary to meet policy objectives, ramping needs should be considered and incorporated in the IRP's requirements. If done correctly, this may ultimately obviate the need for a flexible RA program as the fleet of resources necessary to meet the capacity and energy needs will already have the ramping attributes necessary.

VII.

COORDINATION WITH IRP

In the long-term, the RA and IRP processes should be coordinated to ensure that resource portfolios meet all RA, grid, and GHG emissions reduction needs. This would include capacity, energy, and ramping capability. The IRP process is currently grappling with the fact that the system RA construct does not guarantee that the overall system will have an acceptable loss of load expectation in all hours. Since the proposed net load duration curve-based construct explicitly accounts for available energy in all hours, it may prove useful as a diagnostic tool for the IRP process.

VII.

INTEGRATION WITH IRP

IRP is the mechanism to evaluate future grid needs and develop resources necessary to meet those needs, considering both reliability needs and other considerations such as policy goals. The RA program is primarily designed to ensure that existing resources are accounted for in meeting operating grid needs, are under contract to ensure their viability, and have a must-offer obligation to the CAISO to utilize their capacity to meet reliability needs. It is therefore critical that the planning processes including IRP and elements of the Transmission Planning Process and the Local Capacity Requirement study process are utilized to plan for a grid capable of meeting future needs.

Under this proposal, it will be important for the IRP process to ensure new and existing resources can meet both the net peak load and net energy needs of the grid. In addition, IRP should be evaluating the ability of resources to provide other necessary services to the grid such as ramping and ancillary services. As the grid evolves, the RA program should remain indifferent to which resources provide energy and which provide ancillary services. Today, the must-offer obligation is to make the resource available to the CAISO through either of these elements necessary to maintain grid reliability. But as California progresses in its goals to reduce GHG emissions, it will be necessary to develop the ability of renewable resources to provide ancillary services. As such, the IRP should assess the need for renewable resources, not only from an energy output standpoint, but also from an ancillary services standpoint. Additionally, as LSEs file their IRPs, it is critical that there are clear and actionable filing requirements in place that require LSEs to demonstrate that their individual portfolios are reliable by meeting the same net peak capacity and net energy criteria that is used in the RA proceeding. Incorporating a consistent set of reliability criteria forms a critical bridge between the RA and IRP programs. Once those resources are planned for and procured, the resources will then be capable of providing the necessary elements for a reliable grid operation as the RA program will continue to require a must-offer obligation that can be met by the provision of energy or ancillary services.

Finally, the IRP process should evaluate both available capacity and the likely production output from the available resources to ensure that the RA program is not solely dependent on resources that are unlikely to run due to their economics. While such a mechanism may indeed produce a reliable outcome, the purpose of the planning process is not simply to produce a reliable outcome, but also to produce that outcome while considering other factors such as policy goals and costs.

VIII.
CONCLUSION

The Joint Parties appreciate the opportunity to submit their initial Track 3 proposal for Track 3.B and assist in the further development of the Commission's RA program. For the reasons expressed in this proposal, the Joint Parties encourage the Commission to establish the necessary workshops or working groups to evaluate and develop the necessary elements to create an implementable solution using the RA framework described in this proposal.

Respectfully submitted on behalf of SCE and CalCCA,

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August 7, 2020

Attachment A
Resource Adequacy ("RA") Track 3 Proposal
July 2, 2020

Resource Adequacy ("RA") Track 3 Proposal

July 2, 2020

Energy for What's Ahead℠

Agenda

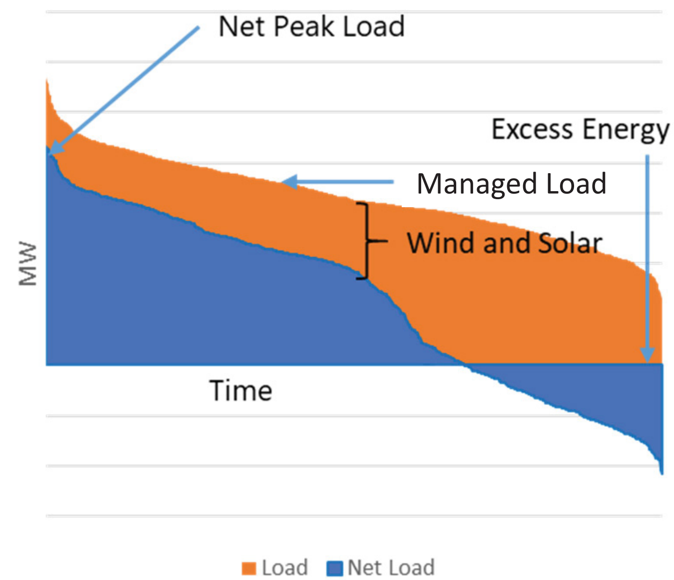
- Overview of SCE RA Track 3 Proposal by Section
  - Questions and answers provided during each section
- Identification of potential joint filing

Introduction

- Key elements causing need for change in the RA program
  - Use limitations of resources different than contractual limitations under the Maximum Cumulative Capacity (MCC) construct
  - Increased deployment of solar resources has resulted in a net peak load service concern during and immediately after sunset while gross load is still relatively high
  - Increasing number of LSEs and portfolio options has led to differing impacts on reliability from each LSE
- These changes have resulted in stresses on elements of the RA program that were designed under different circumstances:
  - MCC buckets addressed the need to meet load in all hours but was dependent on resources that were largely available in any hour and only bound by contractual obligations
  - Better depiction of the net peak load and energy need is necessary to ensure reliability
  - Evaluation of reliability need across LSEs is not necessarily proportionate to load ratio share

Structural Proposal

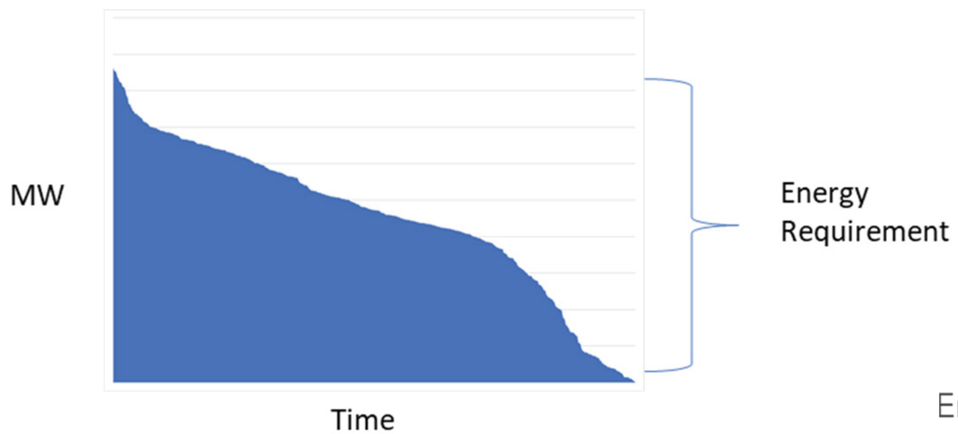
- Net Peak Load
  - The current ELCC construct evaluates wind and solar in its ability to meet peak load needs. This construct does not appropriately account for the contribution toward meeting needs in the hours in which ambient conditions allow for production and the ability to utilize generation in excess of need for energy storage to be utilized at a time of need.
  - Creating a mechanism in which the impact of wind and solar is accounted for in the forecast enables more accurate accounting of the contribution of such resources
    - Forecasting of wind and solar output can utilize existing IRP energy profiles*



* More discussion on Slides 8-9, 12-13

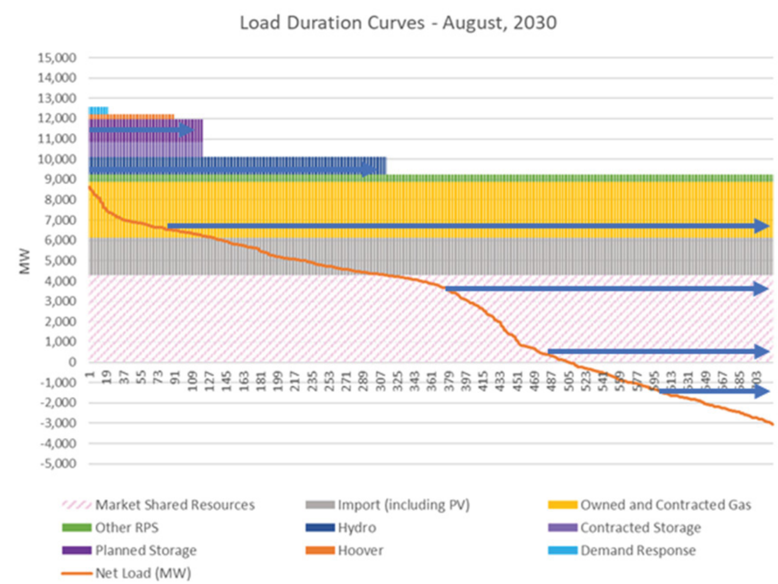
Structural Proposal (continued)

- Net Energy Need
  - MCC addressed the need to meet load in all hours but today faces difficulty addressing use limitations that occur due to physical and regulatory restrictions rather than contractual restrictions
  - Meeting load needs in all hours continues to be important and is met in part by wind and solar and in part with other resources
    - Netting the load needs from expected wind and solar output will depict the energy need that must be met from non-wind and solar resources by procuring capacity with a must-offer obligation that enables the CAISO to access the energy



Structural Proposal (continued)

- Energy Storage
  - Energy Storage will become an increasingly important grid element
  - In using energy storage to satisfy net peak load, the energy need (NQE) will increase by the losses associated with storage round-trip efficiency
    - For example, an LSE using a 25 MW storage device with 4-hour duration and an 85% efficiency rate will need 117.6 MWhs of energy ([4 * 25]/0.85 = 117.6)
  - The energy available for storage can come from supply from any RA resource (including the netting of wind and solar) that is in excess of the load needs of the LSE



Structural Proposal (continued)

- Energy Storage (continued)
  - Capacity value of the storage device will be determined by the energy available to store in the device
  - If the LSE does not have sufficient energy to fully charge the storage device, the capacity of the device would be de-rated
    - Using the prior example, suppose an LSE had only 75 MWhs of excess energy, the capacity would be de-rated to 15.9 MWs ([75 * 0.85]/4 = 15.9)
  - Because this proposal evaluates both peak net load and energy needs, the incentives for storage could be to build high capacity short duration devices or low capacity long-duration devices depending on the needs of the purchasing LSE

Resource Counting for NQE

- Wind and Solar
  - Expected energy output by hour netted from hourly load
- Non-use limited
  - NQC * 24 * Days
- Use limited
  - Accounting for energy from use limited resources will require discussion
  - Where the limitations are easily expressed as run hours per month, the solution is simple (e.g. NQC * Run Hours * Days)
  - Where limitations are not easily expressed as run hours, further examination will be required

Compliance

Step-by-Step Compliance Process

- Develop load curve utilizing CEC load forecast data on LSE basis
- Develop expected renewable energy from wind and solar using LSE portfolio of resources and an energy profile for those resources from the IRP to account for expected energy from RPS
- Net the load curve with the wind and solar output

Hour	Installed Capacity		RPS Profile		Expected Energy		Managed	Net
Ending	Solar	Wind	Solar	Wind	Solar	Wind	Load	Load
1	2,175	770	0%	95%	-	731	1,686	956
2	2,175	770	0%	63%	-	482	1,662	1,180
3	2,175	770	0%	63%	-	483	1,546	1,063
4	2,175	770	0%	55%	-	421	1,473	1,053
5	2,175	770	0%	41%	-	318	1,495	1,177
6	2,175	770	0%	36%	-	280	1,580	1,300
7	2,175	770	21%	16%	467	125	1,571	979
8	2,175	770	57%	28%	1,248	217	1,496	31
9	2,175	770	77%	2%	1,665	15	1,454	(227)
10	2,175	770	86%	2%	1,875	15	1,458	(431)
11	2,175	770	90%	2%	1,966	15	1,440	(540)
12	2,175	770	92%	2%	1,997	16	1,480	(534)
13	2,175	770	89%	2%	1,926	18	1,617	(328)
14	2,175	770	82%	2%	1,791	18	1,757	(52)
15	2,175	770	82%	8%	1,776	62	1,880	42
16	2,175	770	73%	31%	1,593	236	2,045	216
17	2,175	770	60%	26%	1,299	200	2,049	549
18	2,175	770	26%	47%	562	363	2,170	1,245
19	2,175	770	1%	58%	30	449	2,263	1,784
20	2,175	770	0%	60%	-	463	2,224	1,761
21	2,175	770	0%	73%	-	564	2,263	1,698
22	2,175	770	0%	70%	-	542	2,202	1,660
23	2,175	770	0%	68%	-	523	2,034	1,512
24	2,175	770	0%	74%	-	566	1,639	1,073

Compliance (continued)

Step-by-Step Compliance Process

- Rank order the net load from highest to lowest to create a net load duration curve
- Establish the peak net load need as the highest hour net load
- Establish the energy need as the sum of the positive hourly loads for all hours. This represents the area under the net-load duration curve
- LSE shows resource portfolio to meet RA need (done as monthly assessments as the wind and solar profiles differ significantly throughout the year)

Net Load Duration	
1,784	Peak Net Load
1,761	
1,698	
1,660	
1,512	
1,300	
1,245	
1,180	
1,177	
1,073	
1,063	
1,053	
979	
956	
549	
216	
42	
31	
(52)	
(227)	
(328)	
(431)	
(534)	
(540)	
19,278	Positive Net Energy Need

Portfolio of Resources		
Technology	NQC	NQE
Thermal (no use limitations)	900	21,600
Hydro (limited to 8 hours run time)	300	2,400
Run of River Hydro	200	4,800
Geo Thermal	200	4,800
DR (4 hour availability)	100	400
Battery	100	-
Total	1,800	33,600

Compliance (continued)

Step-by-Step Compliance Process

- Portfolio is assessed to see if there is sufficient capacity to meet the net peak load of the LSE (PRM to be determined which will need to account for non-coincidence of peaks)
- Portfolio is assessed to see if there is sufficient energy available from the resources to meet the net load needs of the LSE
- If there is storage in the LSE portfolio, the energy need above is assessed to determine if there is excess energy necessary to fully charge the storage to deliver the necessary capacity

Compliance Evaluation			
	Requirement	Portfolio	Pass/Fail
Net Peak Load	1,784	1,800	Pass
Net Energy	19,278	33,600	Pass

RA Portfolio Available for Charging								
Load	Thermal	Hydro (Use limited)	Hydro (run of river)	Geo Thermal	DR	Sum	Available for Storage	Usable by Storage
1,784	900	300	200	200	100	1,700	-	-
1,761	900	300	200	200	100	1,700	-	-
1,698	900	300	200	200	100	1,700	2	2
1,660	900	300	200	200	100	1,700	40	40
1,512	900	300	200	200		1,600	88	88
1,300	900	300	200	200		1,600	300	100
1,245	900	300	200	200		1,600	355	100
1,180	900	300	200	200		1,600	420	100
1,177	900		200	200		1,300	123	100
1,073	900		200	200		1,300	227	100
1,063	900		200	200		1,300	237	100
1,053	900		200	200		1,300	247	100
979	900		200	200		1,300	321	100
956	900		200	200		1,300	344	100
549	900		200	200		1,300	751	100
216	900		200	200		1,300	1,084	100
42	900		200	200		1,300	1,258	100
31	900		200	200		1,300	1,269	100
(52)	900		200	200		1,300	1,352	100
(227)	900		200	200		1,300	1,527	100
(328)	900		200	200		1,300	1,628	100
(431)	900		200	200		1,300	1,731	100
(534)	900		200	200		1,300	1,834	100
(540)	900		200	200		1,300	1,840	100
							Total	2,030

Battery NQC	Efficiency	Energy Needed
100	85%	471

Requirement	Portfolio	Pass/Fail
471	2,030	Pass

Elements to be Further Considered

- Planning Reserve Margin
  - The PRM was established at 15% based upon the need for ancillary services, forced outage rate, and load forecast error
  - Assumptions on each of those elements and how much they contribute to the overall PRM are not defined as the 15% was largely a settlement within the original RA proceeding
  - PRM therefore covers certainty (ancillary services) and uncertainty (load forecast error and forced outage rates)
  - As this proceeding and this proposal move forward, the elements of certainty and uncertainty should be evaluated and a measure to address them devised:
    - Ancillary Services is a known and can be added to the PRM easily and effectively
    - Forecasting error (load and wind/solar output) could be included in a PRM or could use a more conservative forecasting approach (e.g. 1-in-5 rather than a 1-in-2)
    - Forced outage rates could be in the PRM or the CAISO UCAP could account for them at a resource level
      - In this proposal, forced outages would need to be accounted for in both NQC and NQE

Elements to be Further Considered (continued)

- Diversity
  - The bottom-up approach will account for a higher net load peak than is necessary to satisfy system needs
    - This would result in over-procurement unless addressed in the requirements or PRM to reflect this potential
  - Product trading may be necessary to address the circumstances in which an LSE that is long energy can trade that energy length to another LSE that is short
    - Since the must offer obligation is based upon the shown capacity, the system level benefit will be realized, and the accounting should therefore not produce an outcome that does not benefit the system
- Deliverability
  - The RA structure has historically ensured that if only the RA fleet were available, the grid needs could be served
  - This has required RA resources to be fully deliverable
  - Full deliverability has been a peak load measure
  - How is deliverability measured under the new NQE construct where energy will be needed in all hours and not jus the peak
- Other RA elements
  - This proposal should be pursued for local RA as well
    - This would require the integration of CPE procured resources that are now allocated to LSEs for capacity and energy for their system showing
  - The Flex RA program can continue to ensure that the CAISO has energy bids necessary to meet ramping needs

Summary

Benefits of the proposed framework

- Addresses the changing resource mix & penetration of renewable and use-limited resources
- Addresses capacity and energy needs that are required to ensure reliability and serving load
- Strikes the right balance between a peak-hour requirement and an 8760-hourly requirement
- Replaces MCC construct and addresses the shortcomings of ELCC as currently applied

List of potential items/next-level questions for workshop/working group

- NQE determination for use-limited resources
- Potential NQE trading mechanism
- PRM determination (including the use of 1-2 or 1-5 load forecasts)
- Load forecast process adjustment if necessary
- Application to local RA and consideration of flex RA
- Interaction with CPE process
- Application to hybrid/co-located resources
- Deliverability assessment

Appendix B

Joint Parties' Workshop Presentation

SCE-CalCCA Track 3B2 RA Reform Proposal Workshop Slides

FEBRUARY 9, 2021 CPUC RA REFORM WORKSHOP

R.19-11-009

Discussion Outline

Introduction & Safety	Energy Division	9:30-9:45
SCE-CalCCA Proposal Mechanics Review + Q&A	Eric Little	9:45-10:15
How Should the Commission Evaluate and Compare Proposals? + Q&A	Evelyn Kahl	10:15-10:30
Is the Proposal Compatible with Federal & State Law? + Q&A	Evelyn Kahl	10:30-10:40
BREAK		10:40-10:50
Will the Proposal Improve Reliability? + Q&A	Eric Little Stakeholder Panel	10:50-12:00
LUNCH BREAK		12:00-1:00
Is the Proposal Compatible with Existing Policy & Programs? + Q&A	Nick Pappas Stakeholder Panel	1:00-2:00
What Other Implementation Issues Require Consideration? + Q&A	Eric Little + Nick Pappas	2:00-2:30
Can the Proposal Be Implemented Timely with Minimal Market Disruption? + Q&A	Eric Little + Stefanie Tanenhaus	2:30-3:00
Does the Proposal Provide Wholesale Energy Price Mitigation? + Q&A	Eric Little + Nick Pappas	3:00-3:15
Catch Up & Wrap Up		3:15-4:30

SCE-CalCCA Proposal Overview and Mechanics

SCE-CalCCA Track 3B.2 Proposal

Key Elements:

- Net-Peak Capacity Test
- Energy Sufficiency Test
- Storage Charging Test
- Wind and Solar Treated as Net Load
- LSE-Specific Load Profiles

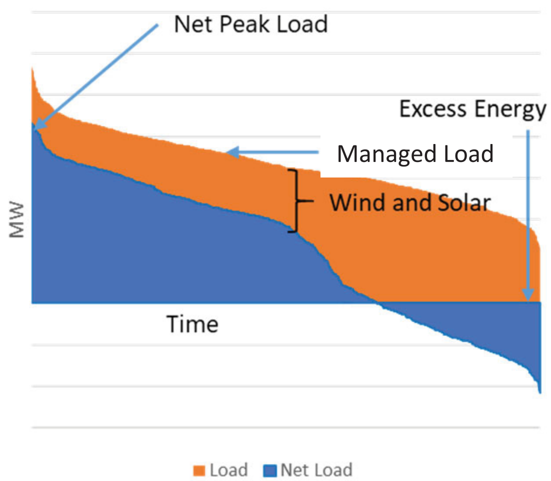
SCE-CalCCA propose critical structural reforms targeting consensus RA program deficiencies

The SCE-CalCCA proposal appropriately balances the need for program reform with the need for compliance feasibility and market fluidity

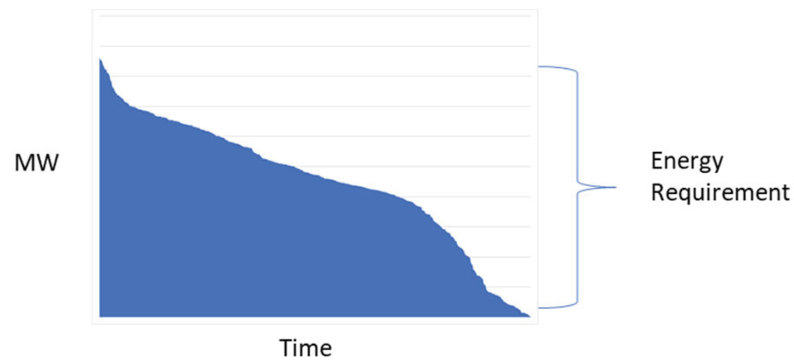
The SCE-CalCCA proposal is compatible with further program calibration and reform (e.g. modifications to PRM, MOO, resource counting, etc.)

Necessary simplifying assumptions are mitigated by existing IRP and CAISO processes which reinforce and mitigate "edge case" reliability risk

Net-Load Duration Curve Methodology

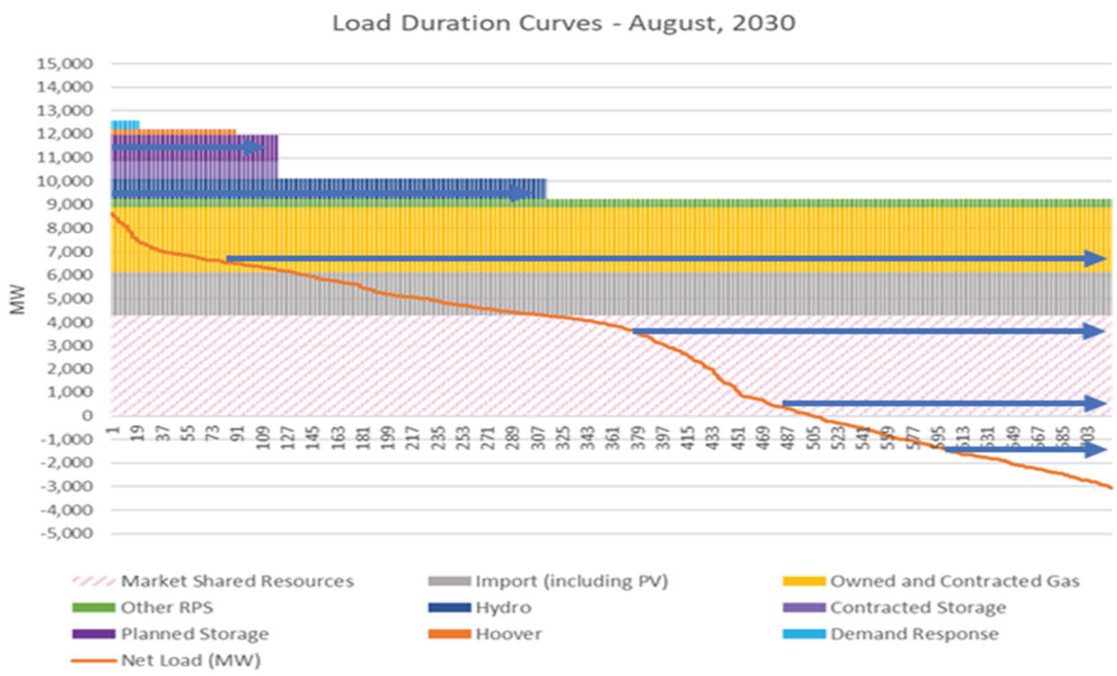


Capacity Requirement:
Monthly Net Load Peak



Energy Requirement:
Sum of Positive Monthly Net Energy

Compliance Example



Simplified example of monthly compliance for August 2030.

- Net load reflects netted solar and wind resources (not shown).
- Blue arrows reflect excess energy available for storage charging requirement.

Consensus Deficiencies, Consensus Reforms?

✓ SCE-CalCCA proposal represents **significant, balanced durable reform** to the RA program structure while limiting incremental complexity.

✓ SCE-CalCCA proposal **does not preclude further reforms** to refine and calibrate the RA program to improve reliability and promote economic dispatch.

Current Program Consensus Deficiencies	Structural Evolutions in SCE-CalCCA Proposal	Calibration Not Precluded by SCE-CalCCA Proposal
• Limited to assessment of gross peak capacity sufficiency • Does not assess energy sufficiency • Poorly suited to non-conventional resources	• Refocuses on LSE-specific monthly net peak • Adds assessment of energy sufficiency • Novel treatment of as-available renewables; explicit accounting for storage charging needs	• Revised load forecast / extreme weather sensitivity • Revised Planning Reserve Margin • Revised Must Offer Obligations • Revised resource counting rules

Is the SCE-CalCCA Proposal *More Complex* or *More Developed?*

"Implementation Challenges" identified in SCE-CalCCA proposal exist across all proposals, but stakeholder outreach has resulted in more "daylight" for SCE-CalCCA proposal.

Problem	SCE-CalCCA NQE	PG&E Slice-of-Day	ED Energy Hedging	ED MCC + Bid Caps
Use-Limitations	Use Limitations Need to be Addressed or Calibrated			
Agency Oversight and Counting (NQC, NQE, LSE-Specific Forecasts)	Similar Agency Involvement Required			
Commercial / Product Details (Trading, Requirements)	Commercial Details Need Development and Resolution			
Market Participation Rules	Market Participation Rules Need Development and Resolution			
Durability	Designed for future grid	Timing and size of slice could need to evolve	Looks to market suppliers to solve energy need	MCC and ELCC likely to need constant revision

How Should the Commission Evaluate and Compare Proposals?

RA Reform Evaluation and Comparison Criteria

- ✓ Is the proposal compatible with federal and state law?
- ✓ Will the proposal improve reliability with growing renewable penetration?
- ✓ Is the proposal compatible with existing policies and programs?
- ✓ What other implementation issues remain that will need to be addressed?
- ✓ Can the proposal be implemented timely with minimal market disruption?
- ✓ Does the proposal incorporate an energy price mitigation function?

Is the Proposal Compatible with Federal and State law?

SCE-CalCCA Proposal Presents No Legal Impediments or Complications

Does the proposal avoid FERC oversight? Maintains a bilateral, capacity-driven framework; does not encroach on FERC jurisdiction compared with current framework

Does the proposal avoid CFTC oversight? Does not create a financial derivative product; avoids Commodity Futures Trading Commission jurisdiction

Does the proposal maximize CCA right to self-procure RA? Maintains California's resource adequacy procurement as a load-serving entity requirement; complies with Public Utilities Code §380

Does the proposal support and complement the existing RPS program? Requires no change to California's Renewable Portfolio Standard program; enables the Commission and LSEs to comply with §§399.11-399.33

Does the proposal support continued planning via IRP? Requires limited changes to California's Integrated Resource Planning process; enables the Commission and LSEs to comply with §454.52

Will the Proposal Improve Reliability with the Evolving Resource Mix?

TEMPORAL ALIGNMENT OF SUPPLY AND DEMAND

USE-LIMITED RESOURCES

SCE-CalCCA Proposal Will Improve Reliability by Addressing Net Peak Demand, Adding Granularity to Supply and Demand Matching, and Provide an Opportunity to Address Energy Needs

Does the proposal address net-peak demand while continuing to address peak demand?

✓ Mathematically, meeting the net peak need and having an offer obligation on the wind and solar for that amount netted will meet the peak load as well

- ✓ RA = Peak Net Load → Peak Net-load = Maximum over the compliance period (Managed Load – Wind – Solar)
- ✓ Since Wind and Solar are non-negative, RA + Wind + Solar ≥ Managed Load

Does the proposal address load forecast variability, resource outages, and variable resource generation?

✓ Directly incorporates estimated hourly loads and variable resource output and utilizes a calibrated PRM to address uncertainty while allowing for varying methods to account for uncertainty (e.g. load forecast method and forced outage rates combined with the PRM)

✓ See following slide on temporal aspects

SCE-CalCCA Proposal Will Improve Reliability by Addressing Net Peak Demand, Adding Granularity to Supply and Demand Matching, and Provide an Opportunity to Address Energy Needs (2)

Does the proposal assess energy sufficiency on a granular enough time scale to address constraints?

- ✓ Explicitly models energy sufficiency for each LSE's monthly portfolio, including explicit assessment of energy sufficiency for shown storage

Does the proposal ensure resources participate effectively in CAISO markets?

- ✓ Maintains current participation requirements (MOO, AAH, etc.) and is adaptable to continued market refinements adopted in parallel (e.g. UCAP)

Does the proposal address use limited resources?

- ✓ Addresses use limitations explicitly through the measurement of energy addressing the issues of when and for how long will the CAISO use the resource
  - ✓ Appropriate solutions through NQC and MOO will be critical in addressing all limitations but is feasible

Temporal and Use Limitation Issues

Incorporating all real-world constraints into the NQC / NQE accounting is a design choice that must be weighed against increased complexity.

In its proposed form, SCE-CalCCA's proposal does not explicitly reflect all real-world limitations:

- Is it possible for a resource producing 24/7 at peak capacity appear to produce an entire month of energy to meet a single hour need?
- If so, how likely is this to occur and what is the magnitude of the issue?

For resources with Use Limitations, how is the amount of NQE calculated?

Temporal Issues and Use-Limited Resources: Special Considerations

- Tension has always existed between the planning nature of an RA program and the daily operation of the CAISO grid
  - RA is performed annually and monthly with MCC buckets recognizing the shaping to load that LSEs will naturally procure
  - This resulted in:
    - Must-offer in all hours even though the RA program did not require such
    - Stringent substitution requirements
    - Complex Master-files to depict use limitations and make sure that the resource operates to its full potential
- Any proposal will need to address how the RA program can remain simple enough to be practical while having sufficient mechanisms in place to ensure sufficient capacity exists to satisfy load needs

CAISO Preliminary Portfolio Assessment is Informative in Understanding Temporal Aspects

- The CAISO Portfolio Assessment (under development) is intended to rigorously test the shown RA portfolio and procure backstop resources if deficiencies exist. Results from the initial Portfolio Assessment (July 2020) illustrate how such a process would review shown RA resources under the SCE-CalCCA Proposal.
- The July 2020 RA Portfolio Assessment:
  - Evaluated July 2020 shown RA portfolio against Peak load, Net Peak load, and energy needs of the grid
    - 2,000 iterations involving 175 hourly load profiles including 1-in-5, 1-in-10, 1-in-20, load conditions
  - Assumptions about resource availability based upon existing mechanisms:
    - Wind/solar based on summer assessment hourly profiles
    - Historic outage rates
    - Model respects Master File data on minimum run time and minimum down time
    - Hydro capped at NQC while utilizing similar historic hydro year production
    - Imports limited to intertie capability (not based on historic MIC)
    - DR assumed to be available for full NQC in all hours

CAISO Study Results Suggest Workability of SCE-CalCCA Proposal

Probability of a shortfall greater than X MW			MW shortfall at X probability		
MW shortfall	RA Showing	Thermal	Probability	RA Showing	Thermal
500	1.98	2.82	4	12	56
1000	1.49	2.14	3.5	15	147
2000	0.75	1.27	3	21	397
3000	0.54	0.97	2.5	94	709
4000	0.26	0.63	2	483	1124
5000	0.15	0.39	1.5	983	1636
6000	0.09	0.23	1	1585	2905
7000	0.04	0.1	0.5	3183	4487
8000	0.02	0.03	0.01	5706	7035

"In the CPUC's RA proceeding, SCE has proposed to transition to only a net-load peak requirement. The CAISO agrees that a net-load peak RA requirement is essential, but believes it is premature to remove the gross load peak requirement. For this interim period, these additional net load RA requirements could be set on deterministic modeling with a planning reserve margin. Therefore, the CAISO will work LRAs and market participants to develop a net-load RA procurement requirement for the 2022 RA year."

Approaching the Temporal Issue

Perform studies of the nature of the temporal issues

- Various CAISO studies could help to formulate the issue such as the Preliminary Portfolio Assessment and/or the LCR
- Longer-term, the IRP should be developing the portfolio of resources necessary to meet the temporal needs for grid reliability

Once the studies are conducted and the probability and magnitude known, then the discussion can turn to solutions which may include:

- A form of MCC buckets to address the hours of energy need
- Must-offer obligations to ensure that energy from certain resources is provided at the points of energy need (e.g. storage)
- Established specific hours for which energy capability must be demonstrated
  - Potentially informed by the CAISO Portfolio analysis
- Factored into the PRM

Utilize the IRP to ensure that the fleet development is consistent with the RA needs so that the resources available to the RA program as technology progresses are capable of meeting peak, net-peak, and energy needs

Next Steps

Solutions to the temporal issue are available

- Studies of the level of reliability (i.e. LOLE) can be performed to determine which of the methods identified is most effective and practical in meeting the reliability need

Prior to the LOLE studies, the CAISO should work with market participants to:

- Ensure the assumptions of resource performance match the RA requirements and proposal structure
- Evaluate additional months within the portfolio assessment
- Discuss structure and how both Net and Gross load peaks are treated under the proposal

Use Limited Resources

	Environmental Restrictions	Operational Minimums	Energy/ Capacity	SOC	Hours of Operation
Thermal	X	X	X		X
Hydro	X		X		
Wind/Solar			X		X
DR		X	X		X
Storage				X	

Impacts

- Ability to meet Peak, Net Peak capacity
- Ability to meet energy need

Single v. multiple aspect evaluation

- This multiple application of a resource will make a single evaluation point impractical
- Which path a resource follows (high capacity for short duration or low capacity for longer duration) will depend on market economics
- Ensuring the RA fleet is capable of meeting either need will require analytics similar to that of the CAISO Portfolio Evaluation as well as treatment of uncertainty in the PRM evaluation

Reliability Panel Discussion

If you had to list your highest priority reliability concerns, what are they and why?

As you review the proposals out there, do any of them fail to address your high priority concerns?

Is there any reliability concern that you have that you believe the SCE-CalCCA proposal does not adequately address?

In your opinion, can the methods suggested sufficiently address the reliability issues already identified with the SCE-CalCCA proposal (i.e. Temporal issues, Use Limitations, etc.)?

Is there anything else you would like to add to the discussion of the ability of the proposal to meet reliability needs?

CAISO MARKETS

INTEGRATED RESOURCE PLANNING

RENEWABLE PORTFOLIO STANDARDS / DECARBONIZATION

LOCAL RESOURCE ADEQUACY PROCUREMENT

POWER CHARGE INDIFFERENCE ADJUSTMENT CALCULATION

Is the Proposal Compatible with Existing Frameworks?

SCE-CalCCA Proposal Compatibility with Current Operational, Planning, and Decarbonization Frameworks

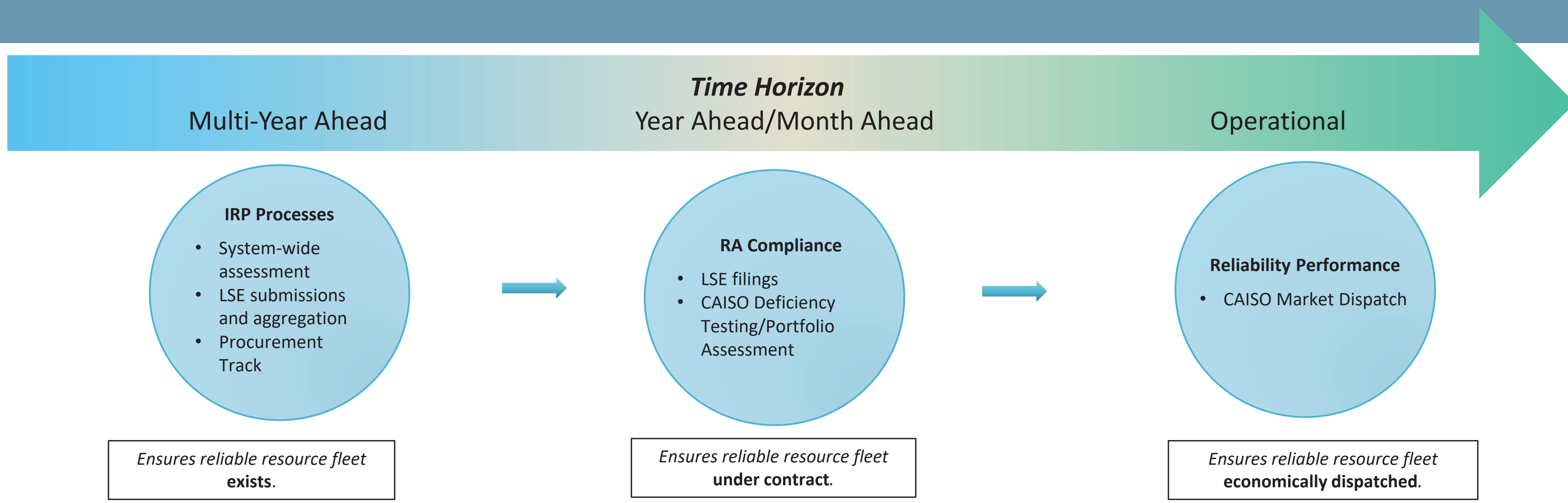
Does the proposal work within existing CAISO operational markets? Maintains existing resource participation and dispatch framework and compatible with further must offer and availability refinements.

Does the proposal support the existing RPS program and other decarbonization efforts? Retains and refines accuracy of reliability incentive for preferred resources, including variable renewables, baseload renewables, and demand-side solutions; retains current LSE-driven renewables market

Does the proposal work with local RA procurement by CPE? Resource allocation from CPE would feed into long-term LSE planning and short-term RA compliance

Does the proposal support long-term planning through the IRP? Designed to work in tandem with IRP resource planning and procurement, supports improved reliability assessment within IRP

RA in the Reliability Policy Ecosystem



- RA is **one of several** mutually reinforcing elements of California's multi-part reliability policy framework.

- While RA requirements should strive to mimic grid needs, simplifications are:
  - Necessary for compliance feasibility and market fluidity
  - Non-disruptive given more robust modeling and backstop procurement via IRP and CAISO Portfolio Assessment / Capacity Procurement Mechanism

Integration with CAISO Market Operations:
No Significant Changes or Impediments

RA has historically been implemented within the CAISO market through a Must-Offer Obligation

- The CAISO has also implemented opportunity costs within its default energy bids to enable use limited resources to provide the most valuable service possible
  - The periodicity of the RA program will have to consider opportunity cost as a methodology
- The CAISO is currently evaluating energy storage and potentially a state of charge restriction to meet net peak load
  - Will this method need change or benefit from change under the proposed RA structure?
- The CAISO is also considering changes to import rules within the RA Enhancements Stakeholder Process
  - Does this proposal require or benefit from any additional changes or should any changes be abandoned under this proposal?

While these questions should be addressed, it does not appear the structure under the SCE-CalCCA proposal would preclude implementation of CAISO proposed RA enhancements items

The proposal would require the CAISO to evaluate the energy-based use limitation associated with NQE and provide a method to deal with such a restriction with regard to its MOO

Integration with Integrated Resource Planning:

No Change to Purpose; Limited Refinements and Integration

The SCE-CalCCA proposal contemplates integration of the IRP and RA processes to ensure that the resources being planned for are those necessary to reliable operate the grid:

- The RA program has not historically been sufficient to develop new resources and therefore, the IRP will continue to be a critical process to ensure that resources are developed to meet state policy goals in a reliable manner
- The IRP process will continue to serve as the overarching process to ensure new resource development to meet state reliability and decarbonization goals
- The RA process will ensure that LSEs contract with available resources (existing and developed through the IRP) to meet reliability needs

Additionally, to improve IRP oversight, the IRP should assess portfolios using SCE-CalCCA reliability tests.

Integration with Renewable Portfolio Standard:
No Change to Program or Added Complexity in Compliance

The RPS could be used as an input to the RA net load calculation

- In addition, having an integrated view of how renewable resources provide reliability as well as what other measures can be taken in concert with renewable resources can be informed by the RA and IRP processes

The SCE-CalCCA proposal would refine and improve reliability value signals for LSE procurement

- SCE-CalCCA proposal will continue to show solar and wind energy value after peak / net-peak capacity value is saturated or eliminated
- SCE-CalCCA proposal will recognize baseload renewable contributions for peak, post-peak, and energy contributions
- SCE-CalCCA proposal will incentivize LSEs to invest in storage at levels proportional to variable renewable resources

Integration with Local Resource Adequacy Central Procurement:
No Change Required

Moving forward, a growing share of reliability resources will be procured via Central Procurement Entity with system reliability attributes (NQC and NQE) allocated to LSEs as a result of the Local RA CPE Decision.

The SCE-CalCCA proposal is consistent with continued allocations via CAM and CPE which fulfill a share of LSE RA requirements.

Early notice of centrally procured resources will be critical to successful LSE portfolio management

The SCE-CalCCA RA framework may be a useful overlay to incorporate in RA CPE portfolio development for local reliability areas

Power Charge Indifference Charge Calculation:
Limited Refinements May Be Necessary

- No change to PCIA framework
- Compatible with PCIA Working Group 3 Final Report Framework
- Capacity product treatment in market price benchmark continues without change
- If NQE is traded as a separate product, should the value of the product be accounted for within PCIA MPB?

Implementation and Compatibility Discussion

As we transition to a new RA structure, what are your highest priority implementation / transition concerns?

As you review the proposals out there, are any of them structurally incompatible with other policies?

What are your most significant implementation concerns for the SCE-CalCCA proposal?

Would the SCE-CalCCA proposal pose barriers to existing contracts or development of new resources?

Is there anything else you would like to add to the discussion of the ability of the proposal to be implemented and integrated with other policies?

What Other Implementation Issues Require Consideration?

Energy Expectations Can be Addressed Through the MOO and the NQE Calculation

Use limitations for NQE can be addressed through the MOO or other methods

- The solution to this will be dependent on a number of elements:
  - Time frame for RA (annual v. seasonal v. monthly)
  - Must-offer obligation
- Does the must offer end once the energy limit has been met?
- Converting some use limits to hours of operation will not be perfect
  - Start limits may or may not limit the amount of energy from a resource depending on how many consecutive hours it is economic to operate the resource
- CAISO portfolio assessment or other economic dispatch evaluation could help with determining these values
- Whatever the level of uncertainty in energy output, the PRM will need to be set in accordance to achieve the desired level of reliability

Forced outages for NQE can be addressed similar to NQC

- Depending on the model selected (RAAIM v. UCAP), the amount of available energy will need to account for forced outage rates
- The UCAP method may be a very good manner to address this as the capacity is derated for forced outages and if then multiplied by available hours will provide the expected energy after forced outages from a resource

LSE Specific Bottom-Up Forecasting Requires Changes

Each LSE will need an hourly load forecast

- The sum of all hours load for all LSEs (i.e. energy) will need to meet the total forecast of the CEC for the state
- The peak loads will be non-coincident and will thus overstate the coincident peak forecast

Theoretically, the sum of LSE load for any hour should be equal to the CEC load for the system as a whole

- Methods need to be developed to ensure that the sum of individual load forecasts do not excessively deviate from the system load forecast

CAISO Portfolio Assessment may also provide check on aggregate load assumptions

This is not a trivial task and will require significant thought and joint work of the CEC, CAISO, CPUC, and LSEs to ensure that the process arrives at the correct result

Netting and Deliverability Can be Addressed Within the RA Methodology

Netting

- Since the proposal depends on netting the wind and solar expected output from the gross load, it will be necessary to estimate expected wind and solar production profiles
  - Various solar/wind profiles exist, including from the IRP and CAISO Portfolio Assessment
  - Indexing weather between production profiles and demand profiles will be important in addressing covariance
- Variability in output will introduce an element of variability (in addition to load forecast error and forced outage rate) to be accounted for within the PRM

Deliverability

- Appendix Y of the CAISO tariff identifies an On-Peak and Off-Peak deliverability assessment
  - Since this proposal shifts from a Peak Load metric to a Peak, Net Peak, and energy need assessment, the deliverability of resources in all hours will become important
- It is possible to assess deliverability more granularly than just the peak as the CAISO has already shown
- The question then would appear to be what granularity is necessary to evaluate peak, net peak, and energy over all hours

Hybrid/Co-located Resources Can be Accounted for Consistent with Stand-Alone Resources

The proposal has battery storage as a method to move capacity from one time to another to serve energy needs

The portfolio is evaluated for its ability to serve load and if using a battery to meet capacity needs, is the remainder of the portfolio sufficient to charge the battery (including losses) to meet this need

The question around hybrid and co-located is whether the restriction to charge from the host renewable differentiates this accounting

Since the storage of a hybrid/co-located can discharge at any time (including while the renewable is generating), it is not clear that the same counting methodology will not work for hybrid

- SCE and CalCCA are open to further discussion if a deficiency can be identified

Variability is a Combination of PRM and RA Forecasting Methodology Considered Comprehensively

With an increase in use limited resources and resources whose production is dependent on fuel supplies, the ability to evaluate uncertainty and the impacts of diversity of resources in the ability to provide reliable operation is crucial

Historically, the PRM has been implemented to address:

- Ancillary Services (known)
- Forced Outages (variable)
- Load Forecast Error (variable)

Under the SCE-CalCCA proposal, there is an additional variability of the renewable generation forecast (which exists today and will be addressed under this proposal explicitly) to calculate net load

Opposing that is the use of a bottom-up non-coincident peak measure

In total, the proposal will require analysis to evaluate LOLE and to set a combination of methods to address uncertainty to arrive at the desired LOLE

Can the Proposal Be Implemented Timely with Minimal Market Disruption?

Implementation Steps and Timeline

Summer 2021

RA Reform Directional Decision

Q3 2021-Q2 2022

Address Implementation Mechanics and Calibrate PRM

CY 2023

Implement for Compliance Year 2023

Implementation Steps and Timeline

Q3 2021-Q2 2022

Address Implementation Mechanics and Calibrate PRM

Finalize Policy Design Elements (CPUC Proceeding):

- The NQE Product – Counting, Assignment, Product Trading
- NQE Must Offer Obligation Considerations
- LSE-Specific Hourly Load Forecasting
- Wind and Solar Netting, Deliverability
- Hybrid / Co-Located Resource Counting
- Calibration – Diversity Benefits, Uncertainty, Planning

Agency Process Changes and Implementation Activities (CEC, CPUC, CAISO):

- LSE-specific load forecasting (CEC)
- Resource-Specific NQC / NQE Assignment (CPUC / CAISO)

Implementation in Compliance Year 2023 is aggressive but potentially feasible.

Outcome is Dependent on Contracting Parties

Ease of implementation is likely dependent of two factors:

- Existing Contract Terms
  - Will the inclusion of an energy measure create contractual disputes?
- Product Trade-ability
  - Will the market quickly and efficiently become capable of transacting an additional RA product

Does the Proposal Provide Wholesale Energy Price Mitigation?

Energy Market Hedging/Price Mitigation Could Be Bolted on to SCE-CalCCA Proposal

Three distinct proposals have been submitted with the intent of mitigating system market power exercise by RA resources:

- RA Resource Bid Cap of $300 or Default Energy Bid (Energy Division)
- RA Resource Quasi-Tolling Contracting Requirement (PG&E)
- Multi-year forward full energy hedging requirement (Energy Division / Dr. Frank Wolak)

While the SCE-CalCCA proposal does not modify existing RA resource bidding obligations, it is compatible with refinements to the existing must-offer obligation requirement if deemed necessary for a competitive wholesale market:

- Any system market power mitigation requirement should consider the role of different bidding strategies in "sorting" use-limited resources to ensure they are not used prematurely
- Bidding requirements should be applied on a going-forward basis only to avoid disrupting existing contracts

Wrap Up